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MOTO-SENSORY DEVELOPMENT

Observations on the First Three Years of a Child

BY

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TO

PROFESSOR WILLIAM JAMES

Honored Master and Friend

AND TO

THE LITTLE MAIDEN

who with such generous and spontaneous
gladness supplied the facts.

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(It may here be said once for all by way of scientific orientation that in general the facts reported in these notes are reliable, however much at times their interpretation may be at fault. Who knows as yet the physiologic motives of infantile behavior?

"Who can tell what a baby thinks?
Who can follow the gossamer links
By which the manikin feels his way
Out from the shore of the great unknown,
Blind, and wailing, and alone,
Into the light of day?")

1st DAY. L's respiration was quickly established; her cries at first were only faint; the eyes opened gradually within a few minutes after birth and were perfectly coördinated from the first. She cried very little the first day. Suction on the fingers and side of the fist was very strong and lively from the first hour. 20th hour: The eyes apparently are sensitive to light, and seem to follow slowly the moving hand and fingers. She was readily quieted when gently crying by "trotting" or even holding a hand or rubbing the forehead.

The fact that gentle joggling up and down was immediately appreciated and reacted to by the new-born thus indicates that the kinesthetic sense-organs already are in action and well connected with the centers concerned with emotional reactions (perhaps the optic thalamus) situated

in the brain and, because of the prompt inhibition demonstrated, also with the cortex of the hemispheres. Such evidence is rather more valid than early embryologic and histologic research, which usually contains elements of doubt—if one may judge by the disagreement among authorities. It is one of the anomalies of psychology and of physiology that kinesthesia, most basal and important of the senses, has been so relatively neglected. Without it no infant a day old ever could become more humanly efficient than a plant.

On Day 67 the inhibitory effect of this touch-stimulation had nearly ceased to be effective. See further on under this first day and see Day 49.

The stroking of her rather pug nose causes in a second or two slow blinking of the eyes. A mere touch on the upper lip or a stronger one on the lower lip causes the immediate screwing-up of the mouth. I noticed yawning once, a sneeze twice and a gentle shaking of the head once. She would not nurse the first day. She seems to be left-handed at present, sucking the left hand more often than the right. The finger-grasp reflex is strong and quick.

The reflex capabilities made obvious on L's first day in the air were, then, respiration; sneezing; yawning; grasping with the fingers; pursing of the mouth and the more complete sucking-process; blinking from touch-stimulation; and the inhibition of crying, also from touch-stimulation. Did the present observer have fully "the courage of his convictions," he would add to this surely incomplete list of first-day reflexes that of followning with the eyes of dull objects (hands) moved slowly in front of them.

Some reflexes (as we have just seen) fade out, more or less immediately, after birth. The reason for this loss of primitive capabilities, reflexes, we may probably find in the common neuromuscular principle that "afferent impulses inhibit reflexes." At birth a host of new sensory influences flood the "cortex of the hemispheres" and tend doubtless

to check all but the most essential reactions graven deepest for biologic reactions in the nervous system,—in a way wholly similar to the cord's inhibition of the withdrawal from acid of a frog's leg by the compression-"sensation" (unconscious) of a rubber band about the other leg. Indeed, this principle may be further-searching and more important in determining animal and child behavior than has been so far credited to it. Here is a compensatory tendency working against the reflexes in proportion to the strength and variety, perhaps, of influences reaching, perhaps, the cortex cerebri. In general, inhibition complicates many psychomotor reactions ordinarily assumed to be simple. What we should always seek is the balance, the algebraic rather than the simpler arithmetic sum of the elements concerned. The problem, of course, is the familiar formidable how to do it.

Inhibition was perfectly exemplified on Day 1 in the checking of reflex crying by the stroking of the forehead or hand. By the tenth day the finger-grasp and the mouth-pursing reflexes were notably less vigorous than at first, and it is possible, certainly, that this eye-following reflex faded even sooner, to reappear in perhaps a more intelligent form at the end of a fortnight.

As is, of course, generally admitted, at first the child's psychophysical nature is on a more purely reflex basis that it is a few days, or even a few hours or minutes, after birth and after the important neural and circulatory changes then occurring. For example, as is well known, a new-born child often will swim if placed in water and sometimes will support itself (Robinson) by the hands like a chimpanzee. This reflexness appears to extend to the three earliest senses (light-vision, hearing, and especially touch) in a marked degree. It is certain that in this child at least stimulation of these senses caused thus early complex reflex movements of adaptation.

It is not clear why the sense of touch should initiate and control organic reflexes earlier and more mechanically than do the other senses, although it is to be admitted that it often

does so. We may perhaps seek the explanation in a comparison of their respective stimuli, for surely the mechanical energy stimulating touch-impulses to the spinal cord is more vigorous than the less massive impacts of vision or of hearing, especially in the "early hours of life." On the other hand, the physiological mechanism relating hearing, vision, etc., to adaptive movement is extremely complex and perfect. It may well be only a matter of the developed perfection at birth—gestation-length?—that determines, then, the completeness of the reactability to senses other than touch. (See Day 119.)

Pavlov's already famous and epoch-making work on the "conditioned" reflexes demonstrates how close is this connection (in the dog, at least) between every sort of sense-discrimination and the reflexes—in the dog's case the reflex secretion of saliva; (one reflex, however, is surely a type of all). Even in the dog no sort of sense-experience, apparently, is too seemingly remote from salivary secretion to fail to set the process in action nonetheless perfectly under certain conditions. (See Huxley Lecture, Oxford, "Lancet," II, 1906.) Such being the now known facts, it seems necessary to look for manifestations of reflex and impulsive action in infants much more complicated (and more intelligent) than they were formerly thought capable of performing.

Another way of looking at these complex early reactions is from the now fashionable viewpoint of the subconscious, with all its capabilities of adapted behavior. Obviously, these are aspects of the same psychophysiologic theory in which the work of the specialist in the physiology of digestion, Pavlov, and that of the expert in subconscious phenomena (e.g., Morton Prince) merge, corroborate, and confirm each other, while education and psychology gain. From the purely neurologic point of view we denote these facts as the group-action universal in the nervous system.*

*See an article on these integrations: G. V. N. Dearborn, "Physiology versus Anatomy," Bost. Med. & Surg. Jour., clxii, 18, 5 May. 1910.

Mrs. Moore's boy's eyes followed a pair of polished calipers on the second day and the moving hand on day eighth, while Miss Shinn notes that no such movements occurred in the studied case of her niece during the first fortnight, but on the first day of the second month her eyes followed a moving candle-flame.

2nd DAY. L. took "proper nourishment" for a short time only. She slept most of the day. She sneezed once or twice. There are no signs of hunger. There is no more lack of eye-coördination today than there was yesterday.

3rd DAY. She nurses vigorously today. The bright light necessary for her "snap-shot" portrait made her general movements much more lively, but she kept her eyes mostly shut. She hiccoughed for a few seconds.

5th DAY. She smiled dimly when tickled on the cheek or under the chin.

This frequently observed tendency to smile thus early occurred only reflexly from tactile stimulation. Although spoken of as dim, the smile was a true smile and employed the same muscles that are active in the adult in this emotional reaction. Its difference is one only of degree, not of kind. Some observers and writers have apparently wrongfully disregarded these lesser reactions, but if not smiles what are they? Preyer's point of view seems unphysiologic. A baby is not less a baby for being small, despite the well-known argument in court. May we not argue, therefore, that a little smile is none the less a smile?

L. sucks the right hand now as much as the left.

6th DAY. The eyes close (reaction-time, one second) from a sudden bright light in the eyes, and her head turns away to some extent. Some facial "signs of pain" were produced by this bright light from

a window. She was easily quieted by rubbing the hands and head.

She seems to hear the tick of a watch held close to the ear, and tends to follow it with the eyes, but not invariably. She seemed to hear and notice a siren-whistle out on the Hudson River, for she stopped moving; she acted similarly from the sound of a mouth-whistle.

Mrs. Moore's boy ceased crying on the second day when his father whistled, and Miss Shinn reports that her subject "started" when paper was torn at a distance of eight feet. This particular, latter, noise is always frightful to young infants for some reason none too obvious and must be classed, of course, as sound heard; still it partakes of vibrations much more stimulating than most other proper sounds. Professor Major's R. showed no sign of appreciating sounds until the sixteenth or seventeenth day, but on the nineteenth hearing rapidly developed. Preyer's boy showed signs of hearing on the fourth day.

7th DAY. She smiled "spontaneously"* when half asleep after nursing.

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*In this book the terms "deliberate" and "voluntary" are intended to mean nearly the same thing; both suggest that the stimuli to the action are not apparent to the observer, while "reflex" indicates the activity of an immediately preceding stimulus, whether observed or not. In this "spontaneous" smile while she was asleep we, of course, have to think of the reaction as part of the complex of well-being (euphoria) in the ordinary manner of the James-Lange theory of the emotions. See G. V. N. Dearborn: "The Emotion of Joy," Psychol. Rev. Monograph No. 9, Macmillans, 1899, and "The Nature of the Smile and Laugh," Science, N. S. XI., 283, 1 June, 1900.

Among the best and most readily available books in English devoted to observations on infant-development are these: M. W. Shinn: "Notes on the Development of a Child," University of California Publications, I., 1899, and II., 1907, "The Biography of a Baby." D. R. Major: "First Steps in Mental Growth," 1906. W. Preyer: "The Senses and the Will" and "The Development of the Intellect." K. C. Moore: "The Mental Development of a Child," 1896. G. A. Kirkpatrick: "The Fundamentals of Child-Study." Perez: "The

L. stretched the whole body and then yawned several times. A low, pleasant whistle caused an incipient smile. The facial emotional expression was marked after a meal by its variety. The reaction of pain was especially complete, and the smile somewhat less perfect. She slept most of the day.

End of 1st Week.

9th DAY. L. drew back her head quickly when I blew on her forehead and face and she did this several times. The eyes are not obviously sensitive to a gas-flame five feet off. She stopped her incessant impulsive movements when a watch was held close to her ears. She seems to like to be held erect. The physiologic vomiting-coördination is complete. The left eye opens somewhat more slowly than the right. The self-scratching of her face caused evident pain and cries.

The promptness and vigor of this general reaction proves that the pain-sense was already connected in the central nervous system much as in older children.

10th DAY. The clapping of hands when she is sleeping causes slight movements of the head backward and the raising of her arms without awakening her.

How closely these movements correspond to the familiar adult expression of surprise and defensive terror need be

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First Three Years of Childhood." C. Darwin: "The Expression of the Emotions."

There are of course many others, and for references to these the reader is referred to the exhaustive educational bibliography long compiled by Doctor Wilson, Librarian of Clark University, and published annually in "The Pedagogical Seminary." A book of great value in this connection is F. Tracy: "The Psychology of Childhood." See also King: "The Psychology of the Child." The far-seeing articles and books of President G. Stanley Hall are of pre-eminent importance always.

only suggested. The reaction implies the completeness with which the universal emotional reactions are engrained in the organism—and this organism at the time was asleep. As part of the foundations of a truly scientific system of education all these evidences of psychophysical integration seem to have considerable practical importance. Reference to the classic emotional postures pictured in Lavater's work on physiognomy (1803) will show in the present instance a degree of similarity a little surprising when one considers the present age of the child.

A prick with a pin on the wrist caused the withdrawal of the latter, but not awakening or other visible phenomenon. Blowing on the face causes, as yesterday, its instant withdrawal backwards. Her facial emotional expression is especially various at the time of gradual waking.

This variety may be due to an impulsive motor tendency to stretch and exercise these very sensitive facial muscles after having been relatively inactive in sleep. It would be of interest to physiology to know how such useful and very complex co-ordinations are ordered in the centers of reflex action.

She pushed the nipple out of her mouth when she had had enough milk. A watch held near the ear caused her to stop even nursing to listen; this was repeated several times, but the last time the inhibition failed.

This inhibition is all the more worthy of notice because the basal biologic actions are the least easily disturbed. Illustrations of this principle are familiar enough among, for example, the domestic animals. It may be observed that the inhibitory mechanism (cortical?) is on what is practically its adult basis at this very early period.

The finger-grasp reflex seems not so prominent as it was at first. The touching of the upper lip does

not cause the mouth to take the sucking-shape as surely as it did at first. She cries less than formerly when held and attended to. She seemed to be pleased at a motile face held near hers—her first certain visual fixation observed.

Raehlman, Witkowski and Preyer agree that fixation had never been observed by them before the tenth day. The unusual perfect co-ordination of L's eyes from the first seems not to have shortened this post-natal period, suggesting that the power of fixation may be a matter of cerebral neuronal co-ordination rather than ocular.

This considerable agreement on the tenth day for fixation intimates that this test might be well used for purposes of comparison. Professor Major, on the other hand, thinks that his R. fixated a face on the fifth day.

12th DAY. A bunch of four stalks of tuberoses held near her face caused her to stop crying and to attend with an expression of evident pleasure; this was marked most by an almost indefinable look in the eyes, which were held wide open.

It is to be regretted somewhat that means were not taken in this test to separate the stimuli of the visual and olfactory sorts. As it is we can well believe that the sight of the tuberoses was as active in the attention as was their odor. The reactions were typically such as belong to the trigeminal (fifth) "nerve"—that complicated group of nerves, physiologically speaking, that has so very much to do with facial expression, being intimately related both to the sympathetic below and to the sensory and emotional centers above.

"Fright" from a sharp exclamation was shown by a short, gasping cry lasting, however, but a second or two.

This reaction surely was not real fear, but only a shock to the central nervous system. Sully: "Studies of Child-

hood," and Major may be consulted with advantage. See under Day 97 for considerations bearing on this often overlooked discrimination.

The sucking-movements are very strong and active even just after a full meal. She cries a good deal, but no longer much at night. She gropes 'round in the pillow for the breast, cries when none is found and regularly extrudes the nipple when done nursing.

13th DAY. When a watch was held at her ear L. turned the eyes in its direction for several seconds and made this reflex adaption on several occasions. She smiled several times after a very full meal. She is just beginning "to take notice;" we have now, perhaps, the very commencement of perception properly objective as distinct from subjective sensation. She gave no sign of noticing a bright scarlet shape held near her eyes. She slept most of the night and day. The removal of her fist from her mouth was resisted forcibly and was accompanied by manifest displeasure, as was shown by her facial expressions and crying.

This forcefulness of the reflex or subconscious will, expending its energy in purely impulsive although often complex acts, needs more physiological study than it has yet received. One thinks too often of dynamogeny as a thing peculiar to voluntary activities, rather than as a condition dependent probably, as Lucas has shown, on the neuronal group-action of the different bundles of a muscle or of a functional muscle-complex (such as the sympathetic controls). The principle of "all-or-none" underlies it. This principle, long known in the heart, for the first time offers us a possible explanation of dynamogeny, of which this forceful resistance may be an early instance. Such resistance means "will" as real as any that an adult might exhibit, but it is the von Hartmann

kind of will ingrained basally in the neuro-muscular mechanism, and only an evolved form of the resistance a leaf of Mimosa would make to an attempt to keep it from folding downward.

L. looks interestedly (?) at her mother's face while nursing.

So far, with but one momentary exception yesterday, I have never noticed any lack of perfect coördination in the eyes; the exception was a momentary internal strabismus of the right eye. No reaction occurred when a fist was suddenly approached to the eyes. Blowing on the face causes, as heretofore, an apparently pleasant reaction (somewhat like that of surprise) of low intensity. Touching the sole causes spreading of the toes. Blowing gently and quickly in her face now causes the quick wide-opening of the eyes and contraction of the frontalis muscle. She keeps the left eye closed sometimes for a few minutes when the right eye is wide open, perhaps one of the many bits of evidence that the left side of the body is at first more reflex than is the right side. Many yawns and stretchings occurred on her awakening from sleep in a moderate light.

Her eyes followed a slowly moved desk-candle flame held about eighteen inches away from them; the eyes turned as far as was comfortable and then the head slowly turned. (This has not been tried before.) This light seemed to cause her to sneeze twice.

Preyer was surprised to see his child's gaze thus following a moving object on Day 23 and says that "other children do not do this until after many months," while Miss Shinn's case showed it first on the thirtieth day. One child's eyes followed in the second week, another at the beginning of the fourth week (Tracy), while Major first noticed that his R's

vision followed a person about the room on day thirty-seventh. As already noted, Mrs. Moore reports the second day. See above, Day 1. Considering the completeness of the psycho-physical unity with which we are born, it is not easy to understand why such typically reflex adaptations should not occur at any time when the requisite stimuli reach an adequately complete reflex mechanism. It is probably, then, wholly a matter of the degree of neural (or neuromuscular?) development. The normal variation in the gestation-period doubtless accounts for the observed wide variation in this capability, as in that of many others. L's eye-coördination was perfect from the first—an unusual condition, certainly, and perhaps in part explanatory of the earliness of this following-reaction.

14th DAY. L's eyes and head follow a hand slowly moved before them. No pupil-reaction to gas-light is as yet distinguishable. She obviously listened to a loud-ticking mantel-clock four feet away and kept her gaze in its direction, but when turned away from it she showed only an uncertain tendency to look towards it again.

If the reader will run over the direct observations noted during the fortnight of this average child's psycho-motor activities since her birth, a considerable variety and range and efficiency will be inevitably noted. The motor capacity actually to be seen has been greater than current embryologic data gives us a neurologic basis for. For example, C. S. Minot, in the fifth of six lectures on "Age, Growth and Death" (Pop. Sci. Monthly, Nov., 1907, p. 462), says: "When the child is born it is very incapable of movement. There is scarcely more than the power of twitching about in a disorderly fashion. Its muscles can contract, to be sure, but any sort of motion that implies a harmonious working together of various muscles, the baby at birth is quite incapable of. This phenomenon is doubtless due to the fact that the cerebellum, the small brain, is as yet imperfectly

developed. If we examine the brain of the child at birth, we find at the edge of the cerebellum a line along which the production of new cells is going on. These new cells migrate over the surface of the cerebellum without changing at all into nerve-cells. They form a distinct layer which is well known to every investigation of brain-structure, and presently after birth these cells accomplish a second migration, but in a different direction. Instead of moving in a constant current over the surface of the brain, each one takes a vertical pathway from the surface down towards the interior of the cerebellum, and arrived there it changes and becomes a nerve-cell, or at least part of them do; and with that the machinery of the cerebellum is complete. Thus, structurally, the cerebellum at birth is an uncompleted organ. Now, the cerebellum is that portion of the brain which regulates the combination of muscular movements, which secures that which the physiologists term coördination of movements, and it is not until the cerebellum has been perfected that it can perform this function."

In the sixth lecture we find it stated: "The instinct of sucking, the baby does have at birth. It might be described as almost the only equipment beyond the mere physiological workings of its various organs. But at one month we find that this uninformed baby has made a series of important discoveries. It has learned that there are sensations, that they are interesting; it will attend to them."

In the third of these lectures Professor Minot relates a fact important as certainly for infants as for the other animals, thus: "When guinea-pigs are born, they are very far advanced in development and the act of birth seems to be a physiological shock from which the organism suffers, and there is a lessening of the power of growth immediately after birth. But in two or three days the young are fully recovered," etc.

There is indeed excellent and varied evidence that this "shock" affects the baby in no small degree, but if so, Minot's above estimate of the efficiency-status at birth is much too low. The organism of the new-born clearly is more

than an elaborate suction-pump. We may be grateful for the above embryologic data on the cerebellum, to be sure, but there's an hiatus somewhere in the psycho-neuro correlation that it will require more than the cerebellum to set right. The nursery sometimes can teach the scientific observer more accurate ultimate fact than the university laboratory can.

End of 2nd Week.

15th DAY. She was pleased and quieted by the sound of a soft whistling. There was present no suggestion of the appreciation of direction. She showed some slight tendency on several occasions to grope 'round my waistcoat as if for food.

For a quarter of an hour she actively sucked her hands all over, crying sometimes from dissatisfaction. Then, perhaps by accident, the left thumb slipped into her mouth, whereupon she sucked it most contentedly for fifteen minutes. It then fell out again by the weight of the tired arm, but she immediately replaced it and went on. On its being forcibly removed, she could not put it back.

This absence of voluntary control over the later efficient muscles of the hand is a useful illustration of the early contrast between the reflex and the deliberate in muscle-action, for the required movements were eminently simple and the pleasure-stimulus to make them, strong. There was, to be sure, some degree of fatigue in the muscles, but the forcible removal of the thumb on the other hand, on the principle of opposition probably tended towards its return into the mouth, at least compensating any fatigue there may have been. Thus in this movement, not concerned in any inherited compulsion, the least power of true deliberate voluntary movement is shown to be utterly lacking on the fifteenth day and for several weeks at least to come. The physical basis of this lack probably lies in the still relative simplicity of the (cerebellar?) motor neurones, making the requisite coördinations impossible. One frequently sees signs that the

kinesthetic impressions, "motor ideas," are not entirely deficient for the grosser kinds of early-developed movements such as this.

L. derives most evident satisfaction (as shown by the wide-open and then closed eyes) from the mere action of this organic instinct-mechanism of sucking. While sucking her thumb, at one time as many as ten backward-and-forward movements of the head were produced by her—were not these a sign of sthenic satisfaction?

17th DAY. Crying was noticeably more expressive today than formerly, at least part of the time; it was more like that of older children, with some elements of a sort of anger in it, as if the occasioning pain or discomfort were more fully and emphatically conscious to her and more personal. This might have been due in part, too, to an increase in the actual energy supply and expense of the organism.

18th DAY. The eyes this evening followed the candle-flame as before, to the right and the left and upward and downward. The head seemed to move sooner than formerly, i. e., the eyes were not strained to one side so much before the head was turned. At first the eyes sought the flame with extreme slowness, the reflex action not being sharp. She seemed to take comfort in seeing a face close to hers, to attend to it somewhat, and to be reflexly a little "interested" in it. *Once, when her nurse had been holding her for a time, on being given her mother's

*See G. V. N. Dearborn: "Attention: Certain of its Aspects, and a Few of its Relations to Physical Education"—a series of articles in the Am. Phys. Educ. Review during the Winter of 1910-11.

breast she insisted on turning her head round sharply to fixedly stare at her nurse.

This action would seem to practically prove the existence and the persistence of a (subconscious?) memory-image of her nurse in her mind for these few seconds, and one vivid enough to serve as a stimulus to a considerable action. As Ribot has emphasized, reproductive imagination is inherently motor (as is also creative imagination). Here is direct evidence of this, too.

This fixed stare, almost like the "charming" excited, e.g., by serpents over birds, is in itself an interesting phenomenon—of the nature of hypnosis or dissociation of consciousness,—type of the trance-state of adults. Perhaps it is a rest-period for some portion or phase of the brain, leaving the remainder freer to act. Of frequent occurrence in infants, it is one of the things most characteristic of a stage of development where reflex attention has full sway over the organism. In an adult, such a reaction would be eminently forceful and voluntary. Perhaps the most noteworthy fact about the reaction is its actuation by a memory-image at this early day. One usually expects reflex attention to react only to percepts—things actually present to sense.

She was entirely incapable of extending the thumb even when it is in her mouth, and even though it would for a considerable time satisfy her well. The legs and arms are still habitually flexed as *in utero,* the legs especially. A warm bath no longer causes crying, but rather obvious enjoyment. Out-door steam-whistles cause her regularly to stop nursing while they continue. The sense of hearing certainly is acute for high-pitched tones.

19th DAY. L. showed a tendency after her bath (and a good night's sleep) to raise herself into a sitting posture. She holds the head fairly well, but not yet quite erect. The eyes are held very

widely open while she nurses. She laughed audibly while nursing.

21st DAY. When gently slapped on the cheek while nursing, she seemed surprised and then puckered up her mouth and cried loudly.

It would not be hard to imagine that certain ethical intuitionists would see in this reaction already evidence for a moral sense! It is, in fact, rather hard to explain, for certainly no pain was concerned and surprise caused eight days earlier a smile rather than tears. Nursing was not interfered with, but we may suppose that it was an interference with her pleasant state of mind that eventuated in her "only language," a cry. Thus Wm. Hamilton, for example, defines pleasure as "the reflex of the spontaneous and unimpeded exertion of a power of whose energy we are conscious," while pain is "the reflex of an overstrained or repressed exertion of such power." Substituting unpleasantness for pain in this definition, one sees an illustration of it here. The first sign of real pain as a special sense appeared on the seventieth day.

End of 3rd Week.

22nd DAY. L. seemed to recognize her bottle today when it was placed within her sight; at any rate she opened her eyes widely and her mouth, and stretched out the right hand toward it. Her behavior was exactly as we might expect at the instant recognition of her bottle when held before her hungry eyes. (See Day 60.)

This apparent ideo-motor complex is one of the most interesting and hardest to account for of all that were observed at any time in this child. Can we think of a reflex, impulsive, organic sort of recognition? Must we set back the date when we are to expect conscious recognition? Rather, certainly, the orthodox probability would be that here was an extraordinary coincidence of false cause and effect, or perhaps some extraneous circumstance that failed to be observed

by even an interested watcher. Such suppositions are, however, scarcely admissible here.

On the other hand, who will set any arbitrary lower limit to the physiologic mechanics of a process which when developed we call recognition, especially when the object concerned is so closely concerned in almost the most fundamental of infantile needs—that for food? What theoretic objection is there to a conjecture that a child's optical and motor mechanism, even at the twenty-second day after birth, might perform "reflexly" the reactions that would tend to the satisfaction of this essential need? The chick just out of the shell sees a worm and reacts so as to obtain it, and anyone would have to admit that it recognizes the squirming object as a worm—biologically speaking. In general, the present writer wishes to emphasize that the human organism includes all, more or less, of the mechanisms of reaction present in the brutes and to express the opinion for what it is worth that more careful observation and more technical analysis would reveal at a very early age the essentials of many psychomotor processes at present classed as dependent on self-consciousness and advanced intelligence in general. (For experimental evidence of the relative inadequacy of ideas for the discernment of likeness and unlikeness, underlying recognition, see G. V. N. Dearborn: "Jour. Philos., Psychol., and Sci. Methods," VII., 3, 3 Feb., 1910.)

It seems likely indeed that we must extend psychological analysis of the infant mind far deeper than it usually reaches at present. The neuromuscular mechanism is efficient for much that were never yet dreamed of in our philosophy.

L. stares at a face when held near hers interestedly. She noticed, while nursing, my moving fingers thirty inches above her eyes, and her vision followed them; also a watch. She uses the thumb of her right hand to clasp with. There is no indication, however, that she voluntarily uses the left thumb as yet; its use is still reflex only, but the

stimuli for this use come through the "light-vibrations" in the "ether."

End of 4th Week.

32nd DAY. L. took her first look into God's heaven to-day, an half-hour ride with her maid; she is said to have seemed "frightened" when she first went out, but evidently enjoyed her ride. She enjoys her bath, too, and always cries when taken out of it.

End of 5th Week.

43rd DAY. L. had her first ride in a horse-vehicle and her first journey on the steam-cars to-day. She cried very little and slept more than usual.

44th DAY. Smiles are very conspicuous after a meal. Her sleep during day-time is troubled somewhat; when she is awake, her arms are in quick, rapid motion—probably a reflex of the impulsive sort originating in the spontaneous activity of the psychomotor centers.

45th DAY. The pupils react to light.

48th DAY. Tears were noticed for the first time to-day running down her cheeks.

49th DAY. She has slept little or none in the day-time during the last four days, and only five or six hours at night. She manifestly enjoyed having her legs fixed and extended forcibly while lying on my lap.

The manifestations of enjoyment at this early age are certainly very complex all together and we need not attempt to mention them even. The most salient points are a very general sthenic activity and joyful expressions in the face connected with the sympathetic action of the fifth nerve.

All these observations of evident satisfaction, if not of delight, in being bounced up and down, in making grimaces, of rolling and tumbling, of making "practice-movements"

with the hands and fingers, etc. (Days 64, 68, 75, 154, 211, 215, for example) indicate the early affective relations of the kinesthetic impulses coming from the compressing joints, muscles, tendons, bones and adjacent skin. Like many of the other pleasures of life, this one is in part the relief from unpleasantness, that namely, due to the need of muscular exercise so frequently experienced even by adults when, in good health, they take less exercise than usual:—"the fidgets." It is one of the functions, then, of the movement-sense to incite us, especially when children, to secure that large amount of muscular activity essential to the proper functioning of many parts of the body, and especially necessary to the growth and evolution of the (psychomotor) brain. For the lamentable effects of a lack of this activity, see the almost uniquely sad but very instructive account of Kaspar Hauser of Nuremburg by von Feuerbach (Ansbach, 1832). (See also under Day 1.)

While lying prone on one's lap she actively rolls her head from side to side, turning it somewhat meanwhile.

End of 7th Week.

50th DAY. L. holds her head almost erect now for a time. Tears ran down a little over the cheeks to-day while she was being made ready for her bath; she never cries while in the water. If one may judge so by the frequent movements of her hands thither some disagreeable irritation is plainly felt in her nose. Tickling of the sole of her naked foot causes marked extension and moderate separation of the toes (the great toe being much abducted) with withdrawal of the leg in flexion. Massage of the abdomen causes repeated alternate, quick flexion and violent extension of the legs together, with less regular movements of the arms. A tendency to hold the feet so that the soles point outward is observable. The

squareness of the lower lip before crying is very perfect; it has not been observed in the upper lip.

52nd DAY. L. seems to be trying to move her eyes, for she looks into her mother's face and is badly cross-eyed at these times, which is something entirely new with her.

This disturbance in the coördination produced usually from the first by the twelve extrinsic muscles of the eyes might very well be due to their unequal innervation in efforts at voluntary control (as indeed is often observed), their respective centers and "channels" not, perhaps, being equally patent.

She has a habit of holding on to her left ear when excited and of pulling on it and also of catching her fingers behind it. She slept last night solidly from nine to three; she seems to sleep equally well on her back or on either side. She now holds her head erect save when tired. She showed plainly by general extension and stretching when undressed for her bath her enjoyment of the heat coming through a wall-register, and spread herself out to enjoy it.

This biologic extension reaction (often seen in house-cats before the living-room grate) indicates the perfection of the heat-sense organs situated in the skin and the nerves and neural relationships concerned. The heat-regulating apparatus is, however, not complete for several years. Relatively cold, indeed, is usually man's reception into the world!

53rd DAY. L. seems to be beginning to use her mouth and other vocal organs to express some of her general feelings of a pleasant tone. After much screwing 'round of the mouth she makes to-day a vowel-sound when delighted by being talked to, etc. The vocal is much like ă ă.

As already has been noted, this may in a sense be deemed the earliest beginning of theoretic voluntary movement—by

no means a voluntary movement, but only the commencement, perhaps, of its obvious development, the lips and other muscular apparatus of the mouth being the most sensitive of the socalled "instruments of expression" at the command of the awakening individual will. Neurally, may we not say that the circuits in the neuromuscular mechanism are gradually knitting together towards the cortex cerebri?

56th DAY. She always sleeps soundly while out in her carriage. I have never noticed any shaking of the head when she was beginning to nurse, nor at any other time save when lying on her belly in obvious great comfort, but am told it has often occurred. Wide-open eyes are a constant sign of her satisfaction or pleasure. She turned her eyes voluntarily somewhat to observe a face held near. Her distinct expressive vocal-sound while being talked to is ă. Her attention is not to be taken as yet away from her milk. The blueness of her eyes is noticeably more intense than formerly. The light near a window even on a cloudy day causes closure of the eyes and a partial turning-away of the head. While nursing, she very often holds her fingers much extended,—expression of joyful feeling.

End of 8th Week.

57th DAY. L. manifestly enjoys her bath and the heat from the register. The washing of her face and head in warm water caused lively movements of the legs and arms. She laughed a good deal at the sight of her mother's face and at her voice; the open mouth was the conspicuous feature of the smiles. She noticed the approach of her mother when the latter came into her visual field when five feet off, as often before; there was no sign that it was other than a reflex. Her habit of catching her

fingers behind her left ear, partly seizing it (noted on the 52nd day) seems to be broken up by the means employed—namely, the forcible and repeated removal of her hand. There was no movement of the eye-lids visible on quickly moving the palm of one's open hand toward them.

A succession of clear loud tones with the mouth causes marked smiles that are something like a laugh, the mouth being held open. When she is held, she keeps her eyes constantly on the face, whatever their relative position. No actual tears on the cheeks have been observed since the 50th day. The quizical look that alternates with smiles when one is amusing her with sounds and faces is very emphatic; this is due chiefly to the action of the corrugator to a slight degree and is probably a sign of slight displeasure.

58th DAY. L. laughed out loud once on "catching sight" of herself in a large mirror; this was probably only an accidental coincidence; she was about a foot from the glass. She was actively joyous in her mild, 58th-day way to-day over her first toy, a silver-and-pearl rattle. She smiled and gazed at it with wide-open eyes as it rattled, and her eyes followed it around carefully. One tear was seen to roll to-day down her left cheek. She reacts with smiles to a sweet, high-pitched talk and a lively face more strongly than to anything else. In general she has all along heard high tones more readily than those of lower pitch. Stroking of her nose no longer causes reflex blinking as it did in the first fortnight. She still stares at an artificial light several minutes at a time, and often makes when necessary some slight effort to do so; she never seems to tire of

doing this. She dislikes the taste of peppermint-water, but will take it when sugar is added. She makes no great objection to plain hot water.

Taste undoubtedly is well developed, at least for sweetness, at birth. Later on peppermint became very much liked by this little girl; her objection to it on this day, then, may be considered as in part a negative sort of taste so to say—she probably missed the sweetness of her ordinary food. Plain warm water, however, was tolerated better. Cicero's familiar remark emphasizing the arbitrariness of taste is perfectly good science still in the Twentieth Century. It is often easier to account for taste-preferences in the adult than in a child of this age, namely, on the principle of arbitrary caprice or of autosuggestion. Here no such explanations are expedient.

L. followed with her eyes a large, dark red chrysanthemum held near her. She dislikes to have her hands covered up. The patella-reflex could not be obtained yesterday, but it was not tried long. She seems to dimly recognize her mother and especially by the stopping of her crying when taken up by her. No movements of accommodation (eye-convergence or divergence) have as yet been noticed.

59th DAY. On being "gurgled" to, so to say, for the first time to-day L. burst out laughing and apparently tried to do the same thing on five or six occasions, and made a fairly good imitation of it. She heard a piano for the first time and cried each time it was played, especially at the upper-register notes.

This weeping is a reaction that is hard to account for save as an over-stimulation of the ears, which is its probable explanation. Overstretching of the two delicate tonic muscles of the untrained middle ear might very well cause discomfort

enough to lead to tears. One often sees this effort in hypersensitive men and especially women—such, for example, as get only unpleasantness from the harmonies of Wagner or of Richard Strauss, and are disturbed by loud thunder rather than the lightning. In a two-months infant the sensitiveness, of course, is normal and protective.

She showed "temper" for the first time by crying when her outdoor clothes were put on for her daily ride—a little specialized "emotion" of anger, having as its basis the instinctive principle of personal opposition perhaps.

60th DAY. She "talks" with her mother a good deal,—the imitative beginnings of a voluntary use of the vocal organs. She shows undoubted signs of recognizing her mother and quiets immediately (when only fretful) when the latter takes her up. She showed no sign of recognizing herself in the mirror yesterday, even although her hand was shaken at the time. She does not seem as yet to recognize by sight her bottle (she has it only once or twice a day) as a friend to her. She sleeps but little for so young a child. She rolled her eyes upward rather far to look at a man standing at her head as she lay in her nurse's lap. She does not suck her hands as she used to do. Her discomfort arising from hunger is expressed by far-open mouth and close-shut eyes. Her hands and arms are moved up and down while nursing synchronously with the sucking-movements:—general reflex rhythm due to pleasant sthenic sensations.

61st DAY. She laughed aloud again when looking at herself in the mirror. (Preyer notes this in his boy at the seventeenth week.) She didn't, however, see her hand when waved in her line of vision

seven or eight feet away; the light was rather dim.

62nd DAY. L. appeared to use shaking of the head as a negative to-day when not wishing to lie down in a certain place. On being put elsewhere she made no objection, but repeatedly shook her head each time when replaced in the disagreeable location.

In a child this much too young to use any sort of signs deliberately, the occurrence of such a reaction as this adult symbol of negation in its proper reference may find possible explanation of a much simpler sort. One sees rolling of the head frequently as a sign of painful restlessness in adults and it may be of the same nature here—an impulsive "expression" of unpleasantness that stirs up explosive motor restlessness, and the head is most easily moved, especially in rotation. The numerous neck-muscles concerned, moreover, have wide nervous connections. See the remarks under Day 427 for an example of the possible origin of head-shaking as a gesture of negation.

63rd DAY. She seemed not to recognize me as I stood at her head while she was lying on her back and cried, but when set up so that she saw naturally she seemed to evince recognition and faintly smiled. She grunts apparently as a sign of comfort, as for example when laid on her belly while suffering from colic, which was thus relieved; the grunt may have been due, however, to the pressure thus caused on her lungs. She nurses sometimes with eyes open and sometimes with them shut. She recognizes her mother perhaps by smell, for even when she doesn't look at her face, she yet quiets down sooner with her than with anyone else. (See Day 12.)

This matter of smelling is a puzzling thing. Helen Kellar in her enlightening book, "The World I Live In," tells how

readily she discriminates all her familiar acquaintances by the sense of smell—that sense with "something of the fallen angel about it." "If many years should elapse before I saw [sic] an intimate friend again, I think I should recognize his odor instantly in the heart of Africa as promptly as would my brother that barks." She also has some striking experiences of kinesthesia related in this book of much suggestiveness. Kroner reports that a girl of eighteen hours refused a breast on which oil of amber had been rubbed. Signs of smelling are observed, he says, a quarter of an hour after birth. On the other hand, Miss Shinn says: "I saw absolutely no sign of sensibility to smell, but, rather, indications of its absence for months after birth." She, however, admits its usual presence at birth. Day 154 was the first on which L. first showed unmistakable signs of the clear perception of an odor. No active early experiments to test its presence were properly made. See Day 12, however.

End of 9th Week.

64th DAY. L. slept last night from nine till five. She seemed to take delight in a bright-red book, watching it more closely than she did a dull book seen under exactly similar conditions. Any slowly moving object is attended to now closely as it moves, my feet in slippers, e. g., three feet away. She can't move her eyes for this purpose oftener than about once in two seconds, however.

This long reaction-time probably implies that conscious effort was employed for making these eye-movements, that they were in part voluntary, for reflex reactions are more prompt than two seconds in case the active muscle be of the cross-striated, voluntary kind. Considerable muscular coördination is required in this movement, and deliberate orderliness of the sort takes time. Young kittens show the same conditions precisely at about the fourth week.

A bell-shaped porcelain lamp-shade was sounded somewhat behind her and she turned her head slight-

ly, but only the first time. As she lay in her mother's arms watching her face as she "talked sweetly" to her, the right arm was abducted repeatedly in a way very suggestive of a beginning of a conscious effort to reach the face with her hand. Saliva is getting more abundant the last two days. No relation is apparent as yet between a sound and its location (see 15th Day). No fear of strangers can be made out. She likes better than anything else to be swung up and down in one's hands. She holds her head well. She stared at a gas-flame 40 feet or so off in the street.

66th DAY. No notion of direction of sound is apparent as yet, for an alarm-bell rung five feet at one side of her ear when she was lying on her back caused no sort of movement towards it. It caused her, however, each time to stop her movements and to listen with obvious delight, as was shown by more widely open eyes, and by smiles.

67th DAY. She looked very interestedly at her own and my reflections in the mirror, gazing intently at them for nearly two minutes.

This was an experience for her that it is hard to think of as void of a dim sort of interested organic "thought," as the long fixation of her attention certainly implies. External stimuli were shut out and inhibition of the ceaseless impulsive bodily motion was practically complete; some sort of representative mental process was perhaps going on within.

L's laughter when held before the mirror on both Days 58 and 61 would seem to imply some sort of stimulation from the mirror. On Day 60, however, no reaction that was appreciable occurred, even when her hand was passively shaken so that she might both see it and feel it kinesthetically. A week later it is certain that her image is observed.

Day 146, etc. Darwin, Preyer and Sully, as

have studied and discussed the mirror-image problem; for a brief summary of this material see Major, loc. cit., page 268.

It would be interesting to experiment on the hastening of the awareness of personality by training a child thus before a large mirror, with passive limb-movements, various touches and other sensory stimuli, appropriate use of the child's name, and so forth. It can scarcely be doubted that training of these sorts, objective, subjective, symbolic and conceptual, would at a time much earlier than usual develop self-consciousness. The doubtful ultimate utility to the child of such procedure is perhaps adequate reason why it should not be tried, despite the light it might throw on the mechanism of the evolution of the will as shown by voluntary movement. We know comparatively little about the cerebral relations of passive and of active kinesthesia, but none the less it is impossible to believe that passive movements would help not at all in developing the motor ideas that are preliminary to voluntary movements. But these motor ideas after all are only one factor in the awakening of the protean ultimate we speak of as personality.

L's delight at the approach of her mother to take her up out of bed in the morning is shown by lively movements of the limbs and face. The cry of hunger seems to be higher in pitch than the cry of pain. A bell attracted her attention, but there was no turning towards it. The habit of sleeping without being held is beginning to-day and she sleeps much of late. She reacts to becoming lullabyes by beginning to cry. The head is not held erect yet when she is tired, but ordinarily it is held well-balanced; see the 50th Day. A curious mixture of pleasure and fear is shown while sitting, nipple-deep or less, in ——— water during her bath; there is no doubt fear, but it is hard to account for save Blowing even gently (as from

whistling) on her face while she is crying causes her to catch her breath, shut her eyes more tightly for a second or two, and then to cry with the increased intensity due to augmented respiratory action. The gentle stroking of her nose, which on the first day and after caused blinking, now gives no reaction ordinarily, although occasionally it does. There is as yet no sign of the winking-reflex. She impulsively grasped her mother's gown while her face was being washed to-day.

68th DAY. L. hung tightly to the handle of her rattle this morning for five minutes, when it gradually slipped out of her fist; the thumb was properly and strongly opposed to the fingers.

This opposition of the thumb is one of the definite movements that are usually recorded by students of voluntary development in infants. The period of its occurrence here recorded is practically that of the child observed by Miss Shinn, while one of Professor Major's boys ("J.") did not exhibit it until about forty days later. Perhaps girls are reflexly more grasping than boys are, or more precocious in this respect, as in others. (For a good analysis of the development of voluntary hand action see Mrs. Moore's Monograph, page 22.)

Can we not properly take this five minutes the rattle remained in her grasping fist as a rough measure for this age of the length of sustained reflexes by the skeletal muscles? Compare the pinch-reflex of the crayfish's chela, which will be found not so long.

Twice L. made mostly futile attempts to put the rattle in her mouth and the attempted removal of the toy was resisted. Her head turned several times as I sideled around her five feet away, and without any apparent fixation of the eyes on any part of me. A sharp hand-clap caused a single quick

winking. The left side of her face smiles more easily than the right—this has been noticed several times on previous days.

Throughout these notes will be found occasional evidence that in this child the left side of the body (especially the face, leg and arm) was appreciably more precocious than the right side. Despite the fact that sporadic efforts were made at times to make L. left-handed and so practically more or less ambidextrous later on, she developed right-handed in the average degree. This early precocity of the left side of the face to emotional reactions (see also Day 90) is therefore theoretically interesting. On Day 127 her right hand was "still in the reflex, clothes-grasping stage, while her left had become a voluntary instrument almost wholly," and on Day 168 it is recorded that she was "very left handed." The left hand precedes also in the acquirement of reflex imitation, as is noted on Day 87. As volition evolved, the use of the right side gradually became more habitual, and on Day 303 it is noted that she then used "the left hand and leg less readily than those of the right side"—practically the adult condition. It is not easy to suppose that this gradual transition was determined from without by the right-handed structure of doors, implements, persons, etc., for at this early period their influence must have been small and it is, perhaps, not unreasonable to say, nil. One of Professor Major's boys ("R.") went through a similar process, but wholly at a considerably later period. Dr. Major's deliberate efforts to overcome the child's increasing left-handedness is, by the way, a striking illustration of the unfortunate prejudice against what is practically ambidexterity. Usually a "left-handed person" becomes largely ambidextrous if of average cleverness. One often sees this idol of the schola exemplified in the school-rooms of to-day,—a relic of an outworn neurology.

When hungry and she begins nursing, her fingers are tightly flexed, but when satisfied they gradually

extend. They extend so actively at times and entirely independent of any sleepiness, for this seldom follows at once.

Flexion of the hand is the ordinary expression of muscular effort just as is the contraction of the frontalis likewise, and we may therefore see in it nothing of an affective nature—it comes from the radiation of innervating energies in the motor centers. But the active extension of the fingers noted in the observations may fairly be deemed corroboration for what it is worth of the extension-flexion theory of algedonic bodily states, discussed elsewhere. It might be in part, too, it is true, a movement of stretching-relief from the flexion strain, but none the less we make no error in pointing out that this is in accord with the basal principle of emotional "expression" that flexor states correspond with unpleasant, and extensor states with pleasant periods of consciousness. Hunger and satiety are typically opposed in this respect. See Day 112, etc. A similar observation was recorded in the original report on Day 74.

Opposition of the thumb and the index finger is perfect in clasping, while the other fingers are not flexed at first at all. There is no reaching to be obtained as yet.

69th DAY. L. looked for some time at the violets printed on her bed-covering and then tried to pick them up. Out-door light causes her to keep her eyes mostly shut. She seemed frightened at the things which passed her carriage on the pavement.

70th DAY. She had her first external hurt today and cried hard because of it for four or five minutes; it was merely a pressure-injury with the corner of a key. The long-continuance of the crying was evidently due to emotional shock. [1] injury was utterly insignificant. She

when at least ten feet away. No tears have been seen on her cheeks lately.

End of 10th Week.

71st DAY. L. is just beginning now to attempt true and obvious "voluntary" movements of the fingers and arms. Her rattle was shown to her and enlicited lively interest, as was shown in part by movements of the hands and arms which, on the whole, tended towards the rattle; this was especially true of the right arm. No distinct reaching is apparent, but only a vague but perfectly obvious attempt to direct the motions of her hands towards the object. Clasping is already nearly complete, and removal of her rattle is strongly resisted. Shaking of the rattle, begun by spasmodic movements, is now continued obviously by voluntary effort. When carried into unfamiliar rooms she gazes actively about, and recognizes plainly that the objects are new. Attempts to fixate her rattle held within a grasping distance caused marked internal strabismus, as on the 52nd Day, q. v. The legs flexed repeatedly in the bath-tub as if she were trying to raise herself from the sitting position out of the water. There were copious tears because of colic.

73rd DAY. She recognized her mother nine or ten feet away and smiled actively. She made a large vocal sound, seemed surprised, and then laughed aloud.

74th DAY. L. could not even reflexly reach for her bright pearl and metal rattle this morning, but when it was first presented all the fingers of the hand extended much as they might at the beginning of a voluntary movement of reaching. In

the afternoon, held by her mother, she repeatedly stretched out both arms for her rattle when it was offered to her, not opening her hand, and she stretched her arm still farther when she could not reach it at the first movement.

This extension outward may be called in one sense the very first evidence of the presence of the conception of tridimensional space. See Day 115.

L. had no power to open her hand and take the offered rattle, but, as in days past, held it when it was placed in her fist. This experiment was repeated five or six times and sometimes she reached farther than at other times, but she always reached more or less.

Major describes in terms strikingly similar to these the same process occurring in his boy "R.", but on Day 110. (P. 25, middle paragraph.)

This gross movement with the arm is clearly on the borderline, the very commencement of voluntary control and yet it is so intimately concerned with the (reflex?) impulsive desire-movements of the child that one almost hesitates to classify it as an "out-and-out" voluntary movement. It illustrates again how very gradually the competent reflex congenital outfit of the individual takes on deliberate guidance from the interknitting neurones of the brain—wherever these are located. It is important to note that not for forty-nine days yet (Day 123) could L. make movements of a corresponding sort with the fingers of this same arm. Were we to apply Lloyd Morgan's useful terms "stereotyped instinctive response" (for reflex action) and "plastic intelligent behavior" (for voluntary movement), these arm-reachings certainly would be in neither class, for on the one hand they were not of a stereotyped nature nor on the

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and head during the first two weeks is the great elaboration of the impulsive movements of the human being when born and its extension into processes regularly classed as mental. These processes are of the conative kind and are most clearly desire and the affective tone that must underlie it. The infant, like the adult, strives after a maximum of satisfaction—is born with an appetency for it, and most assuredly also with a mechanism by which, after a fashion, it can be obtained. We may call the activity of this mechanism impulse, we may even term the actuating tendency behind it nervous energy, but it would be more frank and better psychology besides, perhaps, to recognize the import of subconscious mental states and their complete continuity if not unification with bodily events. Here it is especially that academic psychology can learn much from the scientific empirical psychology of medicine, unhampered as it is by the ex-cathedra doctrines of a deductive age and mode of thought. The importance of the subconscious and dormant phases of the child-mind is only now beginning to be recognized, and at that only by extension from the awakened interest in suggestion-therapeutics. Yet a priori one might suppose that it is in learning, education, especially, that the exploitation of the subconscious aspects of mind would be most obviously necessary. Who will follow up Keatinge's excellent book, "Suggestion in Education" (December, 1907), with much fuller applications to the theory and art of educating? The reward certainly is great.

See also the discussion under Day 22 dealing with the early complexity of psychophysical capabilities.

When awaking L. stretches her arms actively above her head repeatedly, the fingers being flexed. Slight blowing on her face, as when whistling to her, causes regularly a slight frown. She cannot [illegible]s or head at all quickly as yet—not for example, to follow a person before her. Tears ran down her

cheeks to-day, not caused this time by colicky pain. Cool, plain water is now objected to strenuously. When she begins to nurse her hand is regularly shut tightly, but before long it begins to open and when she has finished, or oftentimes before, the fingers are more or less extended—often markedly so.

This initial flexion usually extends to the wrists and forearms as well as to the fingers, but the forearms do not ordinarily extend, although the wrists usually do. (See also Day 68.)

75th DAY. She could not be induced, on trial, this morning to reach for her rattle, although she showed plainly a desire to do this. Nothing could be plainer than that she was trying to do so, but did not know how, for the expression of her face and the position of her arms clearly indicated this. She looked actively 'round the bright parlor this evening in a lively, spontaneous way somewhat new. She has formed a habit now of screwing her knuckles into her eyes as older children do. I could not induce her to reach after a bright object.

When she nurses the bottle she turns her head as when nursing the breast purely from force of habit.

We would have to class this reaction as acquired and little or not at all congenital. On this basis the movement, of no use whatever in case of the bottle, forms part of what the neurologist would term a syndrome or psychophysical complex. It is perhaps worthy of note how early and how mechanical this habit-formation is, as well as how useless sometimes, as indicated by this instance.

76th DAY. L. reached out both fists again today after a gold watch held about one foot in
of her face. The left fist and arm w
somewhat stretched out, so th

outward and inward, but the right fist and arm were reached straight out. These came together in the center, the hands not opening, but they failed to strike the watch. The watch had been held before her about a minute before this reaching-movement occurred.

77th DAY. A small gold watch was held before her this morning in all sorts of ways, but no true reaching-reaction could be obtained. Signs of strong effort were plain, but she was quite unable to deliberately coördinate the necessary organs.

End of 11th Week.

78th DAY. I could not induce deliberate reaching to-day any more than yesterday. L. recognizes the direction and location of sounds appreciably better than formerly, but does not locate them precisely as yet. She moves her eyes after swaying (bright or dull) objects more quickly than formerly. She shook her head (rotation) at a disliked bottle-nipple. Bright sunshine by accident was suddenly thrown directly into her eyes and caused a quick throwing-back of her head and clonic closing of the eyes. I heard two distinct vowel-sounds for the first time to-day, ă and oo, conjoined in the order given, soon after a very high-pitched ee. She grips her two hands together oftentimes now. There is as yet no winking-reflex. Irregular sthenic movements of the arms and legs express her joy and apparently their quickness is proportional to the delight. "Booing" is similarly expressive, but only apparently from sociability at first. A sharp or a quick sound

r approach of a face not too suddenly

king—perhaps a mild expression of

fear. She was not frightened at strangers in the room, several at once, tonight.

79th DAY. No reaching efforts were observed today. (She was asleep most of the time.) L. has not yet learned to swallow saliva. She is acquiring a dislike to her bottle, and will take no more than two ounces of the cream, sugar, and barley-water at a time. Pinching at the end of a finger to a degree which would be very uncomfortable to an adult caused no signs of discomfort, but a withdrawal of the hand, while she smiled.

It is impossible to believe that in an organism so young and therefore so uninhibitive and expressive, a smile could occur, as here, during pain or any sense of unpleasantness. None the less the hand was withdrawn, as, indeed, it would be always reflexly when restraint were felt. So far as the sensitive ends of the fingers are concerned, apparently the *sensation* of pain has not developed at this, the eleventh week. On Day 341 a much less (accidental) pinching of her finger gave her pain obviously. Considering pain a sensation proper, as we must, its early absence would imply that it was not then connected with the (conscious) cortex, although its end-organs were clearly already in connection with the motor centers of the spinal cord and cerebellum. If we may work the argument backwards, so to say, this in itself is evidence of the physiologic contrast between unpleasantness and true pain, an argument for the separate sensational nature of pain; psychologically the distinction is sharp enough.

Yesterday and to-day L. has been holding up her right hand to be gazed at. She looks at it attentively, as if interested for the first time in a part of her body under her control, perhaps the first [illegible] ning of a grope toward an awareness of her [illegible] ality as a conscious and unified

This was, perhaps, the first suggestion to her mind of that doubleness of sensation undoubtedly so important in the evolution of self-consciousness. In this case she was, we may suppose, dimly aware of motor sensations (kinesthesia) in her hand and arm, and certainly at the same time conscious of her hand visually. By this meeting of volition and perception in a portion of her body, the idea "This-must-be-part-of-myself-who-does-things" would gradually formulate itself as her personality, a suggestion of personal identity. One can scarcely think, however, that the kinesthetic sensations as distinct from touch were at this time conscious in her mind, especially when the inhibiting sense of vision was active.

L. stared at a familiar face and head with an unfamiliar bonnet on with great interest (looking rather at the bonnet!) for a long time.

80th DAY. She seemed not to notice to-day in any way a one-fingered tune on the piano, whether played in a high register or a low, nor a lively tune on a hurdy-gurdy playing out in the Park. Her hunger-cry is more passionate now than formerly.

82nd DAY. While lying on her back she turned her head around in the direction of the mouth-whistling, hand-clapping, etc., repeatedly; she begins to recognize the direction of sounds. It is the same when she is sitting up, but the reaction then is not so prompt and the movement of head-turning required ten or fifteen seconds.

It would be found interesting, probably, could it be known in what physiologic and psychologic processes and experiences this long reaction-time was taken up. If we may judge from experimental analysis of what occurs in adults, part of the [illegible]sumed in settling the balance of sound-intensity [illegible] but rather more, probably, in "arranging" [illegible]. The additional length of reaction-

time when she was in the sitting-posture corresponds, perhaps, to the larger number of muscles that then required neural balancing and coördinated innervation; or the difference might be accidental only. In general it is open to doubt if the coördination of many muscles for an action does require more time than the coördination of few. We have already seen slight evidence that it does (see Day 64 also). This is a problem altogether that is worthy of attentive study with precise measuring apparatus. We might find here, in the early months, suggestions that would help develop a rational system of educational "physical" exercises.

I have been unable to get from L. as yet a deliberate movement of reaching for an object to order, although her right hand to-day partly reached out for a watch held near. The facial antics of a bystander caused in her an acute facial laugh. She looked long and with much interest at a fortnight-old kitten held near her. She notices persons across a room, and voices now attract her attention.

83rd DAY. Could not by a noise induce her to look around; this was not tried long. While nursing, however, she stopped and turned her head fully about to look at her maid, who was making a noise; soon afterwards the same thing was done again; the noise was only the creaking of a chair, but for the first time it aroused her curiosity and voluntary attention .

84th DAY. Hungry tonight, L. made a business of sucking two of her middle fingers, these being inserted repeatedly in the way to serve to the best possible advantage. This was done deliberately, there being no "chance" about it now.

Her satisfaction at having her back rubb
bathing was obviously extreme.

Expression of pleasantness from this source is much alike in all mammals; even in the frog traces of the same reactions may be seen. Indeed this pleasantness of rhythmic stroking over the spinal column seems to be very universal in the animal kingdom from frogs and "chameleons" or lower to cattle and elephants and man. Perhaps it is due the widespread gentle and general stimulation given the spinal cord by the vaso-motor rearrangements thus reflexly induced in the spinal axis, or perhaps there is a mild mechanical incitement of the cord, causing a diffuse innervation—in itself usually a pleasant experience. The osteopaths obtain much of their wealth from the pleasantness produced by manipulations of the spine, etc.

L. "played" with a crumpled-up ball of red paper a long time, although the noise made with it was small. The noise made by crumpling paper seems to attract her attention more quickly than almost any other. Plain water taken internally seems to make her very indignant. No tears have run down her cheeks lately. She expressed her satisfaction at being "talked sweet to" while nursing, the eyes wide open, by a deep sigh and closure of the eyes. She looked steadfastly at her image when she was held close to a mirror. She puts the tips of her fingers on the breast while nursing, now. When vexed she almost sits up.

If vexation be an unpleasant emotion here is another instance of flexion as its fundamental expression. More properly, this sitting-up tendency is a biologic reaction towards a preparation for defense, perhaps.

Anger is inherently a sthenic emotion that might tend to expend itself impulsively in taking this position on a purely instinctive basis.

varied noises with her mouth more and
v—always, seemingly, as signs of sat-

isfaction or of interest. There is no certainty of her turning her head toward sounds as yet.

End of 12th Week.

85th DAY. To-day she turns her head to sounds especially unusual sounds, with considerable certainty. She was greatly interested in my red-and-buff bath-robe. Piano-playing and loud singing in the next room seemed to repeatedly soothe her, (see Day 59), she being asleep when it began and awaking soon to go to sleep again; her sleep was more disturbed than when the room is quiet.

86th DAY. She was greatly interested in the moving shadows on the floor, and watched them a long time.

87th DAY. Imitation seems to be on the way to-day, for L. immediately attempts to shake her hand when one makes this movement before her, and often with very good success. So far it is only her left hand that imitates.

(See note of Day 68.) Her left side was consistently more precocious than her right.

I have not been able to get imitation in any other action than shaking the hand. She picked up her rattle lying on her bed's coverlid—the first time she has picked up anything. She reached out to her mother's face while nursing, perhaps deliberately. For the first time she kicked about in her bath for the fun of it, splashing the water about. Yesterday and to-day (begun, perhaps, day-before-yesterday), she has acquired the habit of biting her lower lip; to-day it is very common. Light, as from a lamp or a window, now as always has greater int her than any other things, and such -

pels regularly her gaze. She will not drink water now—even when it is sweetened—nor for the last week or so.

90th DAY. She reached quickly out for a red apple held near her this morning. I have not been able to secure any signs of imitation since it was first noted three days ago, nor have any "voluntary" movements of reaching been inducible. It was noticed again that sometimes the left levator anguli oris and zygomaticus muscles contract in smiling when the right-side muscles do not. She now watches the movement of small things from place to place, and looks over the details of near-by objects. She holds her head perfectly now.

91st DAY. L. is three months old to-day. She reached quickly out for her ring-and-rattle, the reaction-time being short.

A coryza causes discomfort and she puts her hands on her nose often.

In general, L's thirteenth week was a conspicuous epoch in her motor evolution, showing more general deevlopment of efficiency than any preceding like period.

End of 13th Week.

92nd DAY. L. is very "talkative" and jolly this morning, vocals being larger and more vigorous than previously. She has a habit of pinching the breast while she is nursing. She reached out quickly after her silver rattle, etc., this forenoon. She looked with exceeding interest at a twenty-one-month old girl-visitor. She watched people come up
She turned her head regularly toward
hen moved to either side of it. There

is no winking-reflex as yet. She woke up her mother this morning by "talking" so loudly.

94th DAY. She catches hold of the dress, etc., while nursing and at other times. Tickling of the foot-sole causes a slow and inconsiderable withdrawal of the foot. More and more every day now is the voice used expressively, ten or twelve sounds being often strung out into a (semi-voluntary?) expression of interested delight. There is a distinct tendency to-day for her to imitate a succession of differently-pitched sounds.

97th DAY. L. to-day grabs hold of the bedclothes and of her dress and draws them to her mouth. She listened to the crackling of a piece of brown paper and when it was carried behind her she nearly sat up, by a sudden movement, to look at it. When the paper was brought near to her she was very afraid of it, and even of me, although I no longer held it (showing how total her perceptions are).

If we except a momentary gasp coming from nervous shock (occasioned by a sharp exclamation and on Day 12) this was the first clear sign of a true emotion of fear in this child. It comes not a little later than the recorded "fright" of Miss Shinn's case (thirty-fifth day) and still further away from Dr. Major's "R." (a boy), who reacted thus on Day 19. This considerable apparent variation in a process that probably "should" not vary so greatly is evidently due to the consideration hinted at above, namely, that both of these observers as well as Dr. W. B. Drummond (third week) have mistaken a general *nervous shock* such as would be occasioned in any animal or plant by any sort of adequate stimulus for an emotion of fear. An emotion is no such mean thing in fact no such simple, process.

viewpoint, observe the gradual unfolding of the emotional nature in L. as evinced by the records of the weeks following this initiatory day, the ninety-seventh.

In this connection we may gladly quote from Dr. W. B. Drummond's broad-viewing book, "An Introduction to Child-Study," (London, 1907), Prof. Henry Drummond's listed order of emotional development: Fear, Surprise, Affection, Pugnacity, Curiosity, Jealousy, Anger, Play, Sympathy, Emulation, Pride, Resentment, emotion of the Beautiful, Grief, Hate, Cruelty, Benevolence, Revenge, Rage, Shame, Regret, Deceitfulness and emotion of the Ludicrous. How he can include play under a list of the feelings or how differentiate adequately between pugnacity, anger and rage is not quite clear, and most American children, howbeit with those in England, come to a feeling of the ludicrous at a considerably earlier period.

In L's fear of me because recently associated with a fright producing stimulus, we have precisely the same conditions that Pavlov observed in hungry dogs formed the basis of his "conditioned reflexes" in the process of salivary secretion. See the discussion under Day 1.

Fear is shown by her starting backwards, etc., and by closing the eyes. Imitation is exhibited by her joining in singing, etc. She is very talkative and jolly and lively to-day. She was greatly absorbed in a buzzing-sound made by the mouth, and laughed afterwards. It seems impossible still to induce deliberate reaching, although she plainly shows her eagerness to get hold of bright objects, namely, by her gaze and by lively movements and tension in the arms and hands, especially the right. She refused, flatly, to eat from her bottle to-day,— she has been taking less and less from it for some

looked long and steadily at a cousin

f she was conscious of a new face.

No "tears" nor winking-reflex; and no immediate imitation has been observed lately.

End of 14th Week.

102nd DAY. L. is healthy and bright all these days, but nothing new suddenly has occurred. She turns her head quickly around when spoken to now, in whatever direction the sound may come, unless indeed it comes from directly behind her. She watches lights, and looks steadily at a loud-ticking clock. She taps her mother's face and breast and strives to put clothing into her mouth continually. She noticed a red coal-cart in the Park and watched it and its three horses for a long time. No voluntary movements are now obtainable, nor imitations.

103rd DAY. When her mother calls her in a very high-pitched, unnatural voice, L. regularly protrudes her lower lip in a square shape as in the commencement of crying.

The reason for this emotional-expression is perhaps to be found in the unfamiliar squeaky timbre of her dearest and most familiar voice—another example of fearfulness, perhaps, but coming this time from unfamiliarity.

The squaring of the mouth, often seen in infants, is a muscular coördination quite beyond the power of most adults. Its anatomic basis is not obvious; it may occur under stimulation from both the emotional (sympathetic) and the voluntary nerve-centers. (See Day 50.)

L's recent habit of much "talking" has almost entirely gone the last three or four days,—she now makes only relatively disconnected vocals. She no longer hangs on to her left ear as formerly. She delights in listening to the tick of the bright [illegible] clock. The foot-soles are turned in when [illegible] ting. When one plays with her fe[illegible]

shows merely delight at the activity, but exhibits no suggestion of noticing new (muscular) sensations. She again cried during piano-playing. (Day 59.) She notices red much more readily than any other color.

Discrimination of redness from greenness, e.g., did not occur so far as could be observed until Day 183. This note here is evidence at any rate that there is something in the objectivity of redness that stimulates the attention; the biologic relations of redness (as the blood-color) to the brutes is well understood, while green is commonly said to be the most restful of all the colors except black.

L. does not draw back her head when I blow on her face any more, but smiles — she is no longer "frightened" by this and the reflex movement is less than formerly.

105th DAY. She made partially successful attempts to reach her bright rattle-ring, using both hands equally and sometimes both at once. The direction of their movements was right, but their control was more or less spasmodic. A drop of cold water let fall on her brow caused immediately a slight scowl.

End of 15th Week.

107th DAY, Christmas. In all her bright and noisy toys L. was much interested, and yet she made no real reaching after any of them. She likes to be held up on her feet already as if standing were partly instinctive. She has no power even of removing her light toys from before her eyes, however easy it would be if she knew how.

ter, knowing how and efficiency to perform may
emed mutually interdependent and previous
nts indicate that both must be now well on

the road of development. Perhaps the unwonted excitement (sensory confusion in the cortex cerebri?) of a first Christmas seemed effectually to inhibit whatever reflex reaching might else have occurred, for sensory stimuli frequently do inhibit reflexes. See Days 105 and 108, when she reached out repeatedly after objects, although with less incentive, one might presuppose, than on Christmas Day.

108th DAY. L. reached out repeatedly after her silver ring to-day.

111th DAY. She reflexly draws herself up to a sitting posture when one's hands are held convenient for her to seize.

112th DAY. In the four days I have been away she has appreciably developed both mentally and in facial expression. The last day or two she has obviously learned that she can direct her hands to some extent. When trying to take hold of a nearly presented object, her arms make three or four very rapid clawing movements (the right arm being noticeably more active than the left), and then slowly and with obvious effort approach the object.

The physiology of the clonic movements frequently observed in these early gropings of the deliberate will deserves special study. The excitement generated in or sent into the motor "voluntary centers" is evidenced by them, but why the movements are rhythmic is not as "clear" now as formerly, when voluntary muscular contraction was supposed by many to be a tetanus. The continual tendency at present, however, in the physiology of muscle is to emphasize the basal similarity of all its varieties. Witness Lucas's recent work tending to the belief that cross-striated or voluntary muscle acts on the long-known cardiac principle of "all-or-none" (already spoken of under Day 13) and perhaps implying the explanation of several things now mysterious, this and the same fact as related in the text is not

in the training of the brutes. On Day 112 the left hand had already stopped making these rhythmic movements—another bit of evidence of its precocity as compared with its fellow. In the adult these clonic contractions of the skeletal muscles are observed (save in shivering from cold) only under powerful irradiating stimuli in the central nervous system.

The left hand seems more successful in grasping than the right. When an object is held within an inch or so of a hand, it is grasped at once in some one of many different ways.

The apparent ease of a desired movement (e.g., through an inch of space rather than through a foot) makes easier the effort, perhaps because the relationship between the active hand and the object is more obvious, but it also would seem to imply the presence of some sort of awareness in advance of the amount of energy required to make the movement. This knowledge is, of course, an important accompaniment or part of? the motor idea in the adult psychomotor system. Such reactions as we have here suggest that this part, too, of the kinesthetic sense-consciousness is already developed in this sixteenth week.

When L. holds anything in her hands, her gaze is always upon the object and not on her hand. The seized object is invariably taken toward her mouth. She sucked the paint off the ball of a rattle. She pulls herself up straight quickly when one's fingers are given her to take hold of in the necessary positions, or when her wrists are grasped. She has, however, no power to remain sitting for an instant [redacted] but falls backward immediately.

[redacted]nd vigor with which this drawing of the
[redacted]g posture occurs when the hands and
[redacted]e or purchase, suggests an inherited
[redacted]al tendency in this direction.

L. whines almost as does a dog (the sounds are very similar) when she wishes to be taken up from the lying-position. When hungry, the whining sounds are more peevish and are mixed with crying-vocals. She to-day dumbly stared at three strange visitors consisting of a couple of adults and their four-year daughter, especially the latter. She did not make a sound all the time they were here; this is conclusive evidence that she knows strangers from familiars. In reaching for an object (v. supra) it is often missed, but often only by a very narrow margin; she then tries again. She "talks" a little, but only when greatly interested. She obviously revelled in the heat from the register in the wall. Delight is shown instantly by rapid general extensions of the arms and legs. She uses the left hand and arm to reach for things rather more than the right at present. Everything is noticed to-day and especially voices; scales on the piano make her eyes open widely, as do loud, clear tones however produced.

End of 16th Week.

113th DAY. When L. sees anything she would like to get hold of, even when it is at a distance, she makes her left hand a particular shape; she extends the fingers and puts them together and opposes the thumb. It seems apparent to-day that she is starting out left-handed, the right being used in grasping and reaching only after the left has been used. (See Day 1.) Most of the reaching-movements so far are of the forearm only. Some[illegible] she draws her head towards a pre
mouth being in the motion o
using her hand to draw it t

made a distinct effort to sit up this noon, unassisted, in order to better see the clock, her especial friend, ticking away on the mantel six feet off and partly behind her. The right hand seems to be somewhat more efficient than the left when an object is in its grasp—she uses it better, e. g., to push an object toward her mouth. A small morsel of vanilla ice-cream offered her was not admitted to her mouth at all, the lips being tightly closed.

This prompt and consistent closure of the lips thus early against ice-cold food implies the existence at the lips of what is practically a selective protective reflex, guarding the bodily nutrition. How completely it vanishes or is overcome a year or more later it is unnecessary to suggest. There are other mechanisms of this sort in the alimentary canal, for example, the selective acid-innervation of the pylorus as worked out by Cannon and others. Of old Luigi Conaro and of late Horace Fletcher have claimed an acid-refusing reflex for the pillars of the fauces also, but evidence for it is very scarce and the matter theoretically improbable.

L. actively and noisily sucks her hands at times when she is not hungry, apparently "for the fun of it." No imitative movements are just now obtainable on trial, and none have been observed of late. She seems to pay no particular attention of any sort to lively and loud piano-playing. She took cold water from her cup to-day without objection, not swallowing very much of it, however. Oftentimes when she reaches she partly flexes the middle [redacted] in a characteristic way. While playing with [redacted] rubber pig to-day she made it squeak squeezing it, but did not appear on between her visual, auditory ons arising from the action.

115th DAY. Having drawn herself up from the reclining position by drawing on her arms, L. to-day almost sits up and prevents herself from falling backwards by a true muscular effort, but not always successfully; when she fails in this, she falls sidewise. Balancing is obviously a great effort (because involving many muscles in a new way) and is not attempted for more than half-a-minute or so at a time. The right hand now seems more generally useful than the left, though used less; she often uses both hands to enclose an object, which is then regularly carried to the mouth—never to the eyes so far as seen. A tear ran down her cheek to-day. She recognizes her name instantly, and when nursing sometimes stops, turns 'round her head and bursts into passionate tears when called by her name; it seems to be a "reflex" already, this head turning when she hears her name.

Here apparently is a case where the cessation of a pleasure (here impulsive and instinctive and therefore powerful) acts practically like a "pain," producing abundantly the emotion of "grief" (vexation?) Such a negative affective tone cannot properly be called a pain, but only discomfort, but yet, as here, combined with nervous shock in the breaking off of a biologic instinctive act it may readily occasion tears, even in an adult. Women especially have been known to cry from vexation as well as from grief.

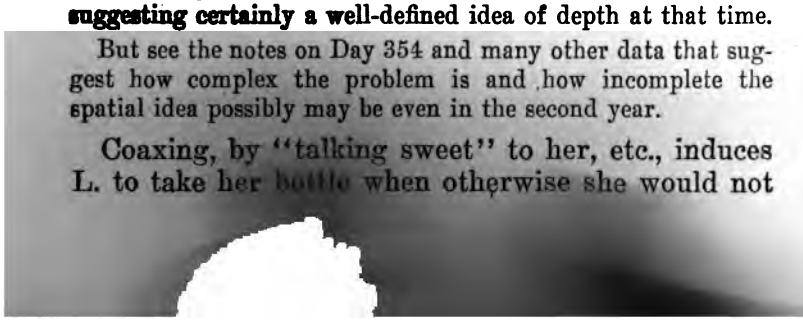
L. watched the smoke from my cigar with interest quite as a cat often does. She does not reach after objects beyond her arm's range, but she does put her hand in the shape preliminary to seizing, when the object is at a distance partly
room. For example, the rapid, spasmo
noted on Day 112 (q.v.) are not observ

extension-movements of the arms are slow and somewhat spastic, but more clearly successful in their aim than a few days ago.

Tridimensional space-conception is probably of gradual growth in the human "associative memory," however it may be in that of the chick et al. The present writer considers that whenever deliberate reaching occurs, that time may reasonably be taken as a criterion of the useful development of this idea. This is perhaps on the not unfair supposition that a child usually will deliberately reach for desired objects as soon as he knows how to do so, but not if he is aware that they are beyond his reach (see Day 127). Reflex reaching (L., Day 22) readily occurs much earlier than this, the retina giving him the outline and so the presence of objects by the differences in brightness of the areas in the visual field. This voluntary reaching was noted in L. on Day 74. Now, on Day 115, there is not only obviously effortful reaching, but it is noted that she watches the spatial movements of tobacco smoke; does not reach after objects beyond the range of her arms; carries objects to her mouth; turns around to sounds (this might be reflex); is forever exploring the cavity of her mouth with tongue and fingers; explores another person's face; and protrudes her tongue beyond her mouth. These acts and others previous to Day 115 suggest that already there is a fairly respectable idea of space, both in lateral extension and in depth, at the basis of her behavior. In other words, already the concept has become practically a percept of space, the concept itself being perhaps a matter of six weeks' growth thus far. On Day 218 she spontaneously crept towards objects that were beyond the reach of her arms—suggesting certainly a well-defined idea of depth at that time.

But see the notes on Day 354 and many other data that suggest how complex the problem is and how incomplete the spatial idea possibly may be even in the second year.

Coaxing, by "talking sweet" to her, etc., induces L. to take her bottle when otherwise she would not



do so. This evening she sat up very well and quite straight. She has no idea of the direction of a sound when it is made immediately back of her, and refers any sound or voices there made to whomever else is in the room; when the sound comes obliquely she turns around. She has been apparently exploring her mouth to some extent with her hand yesterday and to-day, playing with her lips and tongue perhaps; the latter is extended more than heretofore, sometimes going beyond her lips; she plays likewise with her mother's face. She now imitates a smile.

117th DAY. L. could not, or at least did not within a minute or two, remove her silver rattle-ring from before her eyes and face as she lay in her carriage. She wants to sit up all the time at present and whines most of the time when she is not in that position. She can be sung to sleep now.

119th DAY. She picks up objects that lie in her lap when she touches them, but apparently not when the objects are laid before her and which she only sees.

This same thing is conspicuous in kittens six or seven weeks old.

There are other illustrations, striking enough as beheld, that touch (and kinesthesia) are more closely involved in the motor mechanism than is vision. The fact underlies a practical educational problem toward the solution of which investigations are now going on. Education in motor efficiency has much that is fundamental to it yet to learn! (See the discussion under Day 1, page 1.)

As for the usefulness of the feelings of movement (kinesthesia) as a part of sensorial education proper, we touch an educational topic as yet almost wholly und even, much less developed and practically applied

general efficiency and happiness of the individual. Only the marvellous intellect of Helen Kellar, so long hid under a fate that has overwhelmed nearly all who have undergone it, only she, triumphantly alive and a keen psychologist withal, has so far published evidence as to how much pedagogical ingenuity might if it would make of these nerve impressions arising in the joints, muscles, tendons, bones and the skin over these parts. In the little book already referred to this feminine "Doctor Manette" and "Monte Christo" speaks of these influences, even those arising from jolts and vibrations, thus:

"Necessity gives to the eye a precious power of seeing, and in the same way gives a precious power of feeling to the whole body. Sometimes it seems as if the very substance of my flesh were so many eyes looking out at will upon a world new created every day. The silence and darkness which are said to shut me in open my door most hospitably to countless sensations that distract, inform, admonish, and amuse. * * * * * * There is nothing, however, misty or uncertain about what we can touch. Through the sense of touch [kinesthesia] I know the faces of friends, the illimitable variety of straight and curved lines, all surfaces, the exhuberance of the soil, the delicate shapes of flowers, the noble forms of trees, and the range of mighty winds. Besides objects, surfaces, and atmospherical changes, I perceive countless vibrations. I derive much knowledge of every-day matter from jars and jolts which are to be felt everywhere in the house. Footsteps, I discover, vary tactually according to the age, the sex and the manners of the walker. * * * * *

Footsteps are frequently interrupted by certain jars and jerks, so that I know when one kneels, kicks, shakes something, sits down, or gets up. Thus I follow to some extent the actions of people about me and the changes of their postures. * * * * * * A slight flutter on the rug tells me that a breeze has blown my papers off the table; a round thump is a signal that a pencil has rolled on the floor. If a book falls, it gives a flat thud. * * * * * * On a lawn or the

road I can feel only running, stamping, and the rumble of wheels. By placing my hand on a person's lips and throat I gain an idea of many specific vibrations, and interpret them [that is, emotional expressions, aside from spoken words]. * * * * * * The utterances of animals, though wordless, are eloquent to me. * * * * * * To continue, I know the flop of liquid in a pitcher. So if I spill my milk I have not the excuse of ignorance. I am also familiar with the pop of a cork, the splutter of a flame, the tick-tack of the clock, the metallic swing of the wind-mill, the labored rise and fall of the pump, the voluminous spurt of the hose, the deceptive tap of the breeze at door and window, and many other vibrations past computing.

There are tactual vibrations which do not belong to skin-touch. They penetrate the skin, the nerves, the bones, like pain, heat and cold. The beat of a drum smites me through from the chest to the shoulder-blades. The din of the train, the bridge, and grinding machinery retains its 'old-man-of-the-sea grip' upon me long after its cause has been left behind. If vibration and motion combine in my touch for any length of time, the earth seems to run away while I stand still. When I step off the train, the platform whirls 'round, and I find it difficult to walk steadily. Every atom of my body is a vibroscope. * * * * * * The thousand soft voices of the earth have truly found their way to me—the small rustle in tufts of grass, the silky swish of leaves, the buzz of insects, the hum of bees in blossoms I have plucked, the flutter of a bird's wings after his bath, and the slender ripping vibration of water running over pebbles. Once having been felt, these loved voices rustle, buzz, hum, flutter and ripple in my thought forever, an undying part of happy memories."

Does anyone doubt the advantages of developing a sense that will enlarge one's intrinsic and extrinsic horizon in ways like these? Can one easily exaggerate the importance of a sensibility that will, like this, put the unrolling personality

in closer touch not only with itself but with all Nature else? What then of its relations to "manual" training and the other motor efficiencies that are so largely the means of the world's evolution?

L. handles objects held in one hand with the other hand sometimes; they are usually held in the left hand. Her teeth are apparently irritating her, for the last four or five days she has been peevish at times, taking only cat-naps in the daytime. She does not object in the least to the taste of castor-oil.

On Day 58 oil of peppermint was apparently disagreeable to her, but to-day even castor oil, detested on Day 385 and ever since, was not objected to in the least. Who will give us the physiology of taste and smell and explain its arbitrariness?

L. sits up fairly well now, and has learned to balance herself, although antero-posteriorly better than laterally; she usually now falls laterally, but sometimes forwards. A piece of bright crimson paper laid in her lap caused lively movements, not wholly of reaching, but rather a general sthenic excitement of the psycho-motor mechanism. When she has to accommodate the eyes for near objects (sometimes only an inch or two from her nose) it is her right eye chiefly that turns inward, the left doing so to a much less degree.

The date of her first accommodations was unfortunately not noted. Preyer, Miss Shinn and Mrs. Hall agree in placing the period at about eight weeks. **End of 17th Week.**

120th DAY. L. seems to use her right hand to-day better than yesterday. She noticed her feet for the first time (someone held them up) and handled her toes as she would any other object—but without giving any sign of the doubleness of the

sensations that we may assume were experienced. Her toe goes into her mouth without much difficulty. Preyer noted seizing on the eighty-fourth day. She watches her mother in a very interested way whenever the latter is in sight and at all in motion. She seems to take great and real interest in her mother and to love to watch her face. When taken up from a plane surface she usually jumps by pushing with her feet. She is beginning to laugh systematically like an older child whenever her mother says things to her in a funny way. One remark thus made and with a funny expression made her laugh out loud boisterously a dozen times or so in succession—a hard relationship to explain, as indeed are all matters relating to wit and humor.

121st DAY. She uses the backs of her fingers to push and to hold things, e.g., her big ball. In delight to-day only her right arm makes the same rapid clawing movements that both arms made a week or so ago. The left arm seems to be now so well under voluntary control that it no longer makes these.

123rd DAY. The child L. was four calendar months old yesterday. She has advanced in the use of her hands by learning how better to apply them to objects that she wishes to grasp.

Sigismund reports a child as grasping for objects at nineteen weeks; Preyer's boy did this on the 117th day, and he noted the eighteenth week in case of a little girl.

L. opens her left hand fully now in grasping and abducts the thumb before the former reaches the object, but the right hand has not yet learned to do so. She noticed the reflection of herself and me in a mirror six or eight feet away. She shook a rattle

against her face as if deliberately to further enjoy the sound. The winking-reflex is apparently partially developed now. (Preyer, 57th Day.)

124th DAY. The winking-reflex to an unexpected object suddenly brought near the eyes is present to-day in L. as in adults, although the reaction is obviously slower and not so perfect.

This wink-reflex seems relatively late in L. Major's "R.," e.g., had it well developed on Day 49. It seems proper to suspect that a better knowledge of inhibition would explain many of these conditions, for it is hard to suppose that so basal a reflex should be so variable in the period of its perfecting. Taking the complexities of its possible inhibition into consideration, however, we can see reason a-plenty for the irregularity that really is only apparently such. See Day 130.

L. picked up her rattle only *seen* this time lying before her (see Day 119), but she is not yet equal to removing it when placed at her ear or in any other unusual position. The pain from a slight wound in her nose caused her to cry a little, as did also that from a wee spank given her in fun by her mother, but which was misconstrued. She noticed and cried a little to-day when a toy with which she was playing was taken away—the first time this understanding of what it is to miss something has been evinced. She laughs out loud and all over oftentimes at things vivaciously said to her, and often very suddenly two seconds or even three or four after the stimulus has stopped,—the early latent period of joy.

All this joyousness of a healthy baby, so conspicuous in L. continually, impresses the persistent observer as a most unreasoning sort of delight, nearly organic in origin, in-

stinctive, spontaneous and yet delightfully natural and as inevitable as the same condition in a kitten. Whatever the "algedonic balance," whether pleasant or unpleasant, in the average adult, in the normal infant it is certainly strongly agreeable. Here it is, in babyhood (or else in brutes) that one must seek the uninhibited and natural "expression" of the emotion of joy: sthenic expansiveness. See Day 127, et passim.

While loudly "talking" the rhythm was very conspicuous, three or four verses 4/4 time being noticed in succession: something like a stanza of a song in vowel-sound, the pitch-range being perhaps four or five notes.

125th DAY. While sitting in her carriage, L. noticed the fancy scroll-work on the right side of the vehicle and reached her left hand across in front to take hold of it. She has had another attack of loud, lively, and varied "talking" today, her big parti-colored ball especially calling forth noisy and various delighted praise. She watched some boys at play out in the Park with great interest. She sits now up straight whenever allowed to do so. The winking-reflex is not invariably present by lamplight today: it is far less perfect than it was yesterday.

126th DAY. She laughs actively at sight of herself in the mirror, much pleased, as she might laugh to see another baby.

End of 18th Week.

127th DAY. L's right hand is still in the reflex clothes-grasping stage while her left hand has become a voluntary instrument almost wholly. (See Day 68.) She expresses delight today, being in excellent spirits, by loud, often very loud "talking"

or shouting; her large, rubber, bright tricolored (red, yellow, and blue) ball especially occasions this, but also the sight of herself in the mirror, and even her friend the clock. Her voluntary attention to objects is noticeably more intent than heretofore. In her "talking," sometimes her tongue comes to her mouth turned on edge—a posture not deliberately possible with most adults; she makes her jaw go actively at these times while uttering a very large number of vocals, too many accurately to be defined. The range of arm-movement in reaching is daily larger. In the experiment of approaching her bright ball directly toward her eyes from a distance, she does not move her hand to take it until it is within reach or within one-and-a-half arm's length away, or even nearer.

130th DAY. Today there was the first direct evidence of the presence of a visual memory-image in her mind: she was near a lamp and looking at it with delight, but was then turned away so that her back was toward the light; she twice turned her head around as far as it would go both ways to see the light again.

It is not strange that a bright lamp-light should be the first object to remain in her memory as a visual image.

The left hand-grasp is noticeably more perfect and much quicker than formerly. In reaching L. very often misses the object, especially if it be near her chest. The winking-reflex today was constant the first times it was tried, but was apparently inhibited afterwards, as it may be by adults,—another evidence of efficiency in voluntary control. (See Day 124.)

Inhibition was clearly exhibited by L. as early as the first day—the purely reflex inhibition of impulsive general activity by a touch-stimulus. This present inhibition is probably in part at least a voluntary process originating neurally in the developing motor centers of the cortex of the hemispheres—"low down on and posterior to the fissure of Rolando." On the other hand, there may have been acting in a minor degree in this noted failure of the eye-lids to reflexly close after a time the principle of toleration (probably in reality a symptom of fatigue along the exact reflex paths in action), many reflexes failing to recur indefinitely. To be able to say surely how greatly inhibition was concerned in this cessation of the reflex would be obviously to experience the total consciousness of the child at that time and to know her "motives," feelings, &c.

L. had never experienced the harm that usually would come from inhibiting the wink-reflex or she certainly would not have done so. An adult never does so, although so easy, unless the movement threatening the eyes is made by a person whom he is sure would make only a feint at a blow. In general voluntary inhibition is our best index of psychomotor and voluntary development of the individual as it is with equal clearness and importance in social civilization and culture.

131st DAY. Supination of the hands seems to be a comparatively late acquirement, for in reaching for anything held in the middle line near her while lying down L. still flexes the forearm with the hand pronated, and when the hand reaches the object she is unable to supinate it fully and promptly. She has had a habit of vigorously rubbing the lower gums with the flexed tongue, back and forth. She recognized her nurse coming up the front steps outdoors, jumped about and "waved her arms." Have not noticed lately any asymetry in the movements of the face, as formerly, e. g., in smiling.

There is no distinct biting as yet, at least not deliberately on trial. Once only was it observed—not very conclusive to be sure, save that the action is developing.

End of 19th Week.

134th DAY. L. bit my offered finger at once today and chewed on it, instead of sucking it as heretofore; but she is as apt to do the one as the other. She let fall on her lap her bright ball (held about a meter above her head while she was lying flat) and did not notice it fall, but still gazed at my hand.

This lack of gaze-following was clearly due to the long reaction-time of eye-movements.

While bathing, L. was kicking about perhaps more actively than usual and splashed a few drops of the warm water on her face: she burst out crying violently and it was made worse by her being for a moment put back into the tub; the crying continued sometime violently. No other cause was observable, the water, etc., being right. Later in the day she cried in the same way after looking intently at the face of an uncle, an almost stranger to her.

When "talking," the range of pitch and the force of the tone is proportionate to the degree of excitement of her joy or interest. She still rubs the soles of her feet together when kicking freely. She can now support her weight on her feet for a second or two at a time.

135th DAY. L. showed the same degree of fear of her bath-water that she exhibited yesterday and, as was the case yesterday, not when first put into it.

137th DAY. Neither yesterday nor today did she exhibit fear while in her bath: it lasted but two

days, this fear. She has today a habit of sometimes quickly ducking her head when one speaks to her or when she is pleased. A sharp clapping of the hands makes her wink when she is watching the hands, but not unless the sound is of a certain intensity. If it is a feint (quick movements without noise), it only sometimes causes winking and never with the completeness that the movement plus the noise causes. She therefore associates to some degree the movement and the sound, but not yet perfectly, by any means. She pulls one's hair whenever she can get a hold, and an opportunity invariably induces a series of well-contented "remarks."

139th DAY. L. now recognizes well enough the direction of sounds coming from directly behind her, for today when I spoke to her, etc., she looked entirely round at me directly. She now almost draws herself into a sitting-posture when lying flat.

140th DAY. She evidently takes her reflection in a mirror for a real object, for today, besides laughing with delight as she invariably does, she tried to taste of the supposed object when brought closer to the glass, opening her mouth and extruding her tongue as she does for all closely presented objects.

Realization of spatial depth would seem to be implied in these tasting efforts having occurred only on the apparent closer approach of the object. See Day 115.

Tears have been abundant and saliva sufficiently so. She now keeps her right hand in her mouth most of the waking time. Arm-action is better every day, and the use of her hands especially; she uses the right arm and hand now oftener than before, perhaps sometimes even more readily than the left. Delight when a bright object is presented, e. g., an

orange, is shown by very lively and vigorous movements of the arms and legs—sthenia. She seemed (by a laugh, etc.,) to recognize her mother when asleep, being held up above the latter.

End of 20th Week.

142nd DAY. Her eyes and head-movements follow her large red rubber ball when rolled not too fast along the floor.

143rd DAY. L. took deliberate hold of her toes for the first time this morning. She takes her food once a day from a spoon readily, but she has "struck" on the use of her bottle.

144th DAY. She seems to associate the sounds of her toys with a notion of desirability even when she cannot see the toys; more interest is shown in these sounds than in any others.

This sort of association, if not that noted on Day 137, contains the essence of the concept of causality. This, too, could not be expected to develop without the fusion of percepts plus an awareness of her own voluntary power as agent.

L. sits sometimes a minute or so at a time with her head partly bowed as if in a "brown study." Any sound at these times is easily noticed.

These periods, of the nature of automatically occasioned rests of consciousness, as is generally admitted, are true dissociations of consciousness, and, like other varieties of this process, show at least the usual degree of sensitivity to sensory stimuli. These are among those that Professor Morton Prince has named co-conscious states. They have never been observed in this subject since infancy, and then only once or twice, of which this instance is the most conspicuous example.

There was today just a suggestion of a frown on L's forehead from the odor of my tobacco-breath.

She makes now a sort of a snicker when she is pleased, this being ended by a quick turning-away of her head for a moment. When waking this evening, hungry, the sight of her mother seemed instantly to remind her of her hunger, for she at once whimpered, although half asleep. She lookes up into one's face with an expression of great interest and attention. She was trained three or four times today to take one's fingers when held out to her while lying down, and she seemed to learn in the three trials, for she's always very anxious to sit up, and now, indeed, sits perfectly. She supports her weight on her feet longer than on the 134th Day, ten seconds perhaps, and she obviously enjoys it. She took her bottle today after some coaxing. She cries sometimes when her toys are taken from her.

L. does not as yet clearly discriminate a small object offered to her from the hand offering it, and is still apt to take the hand instead of the object. She took a peanut in the shell into her hand and seemed to forget all about it; she did not put it to her mouth like large objects.

The touch-sensations from her hand were adequate to continue the reflex clasping of the object, but not clearly enough in her consciousness to keep her attention. Are not such nervous afferent impulses usefully called subconscious?

L. held her rattle during a nap, tightly, and kept it on waking. She uses her right hand more than her left at present. She made the insides of her feet red by rubbing them together so much. The frequent high-raising of the legs when she is lying on her back seems an effort to sit up, but there is no purchase for the muscles and the legs fly up. I could not induce imitative movements, as of the

arms, hands, or face. One's protrusion of the tongue always seems to astonish her. None of that shaping of the hand in reaching, noted on 113th Day has been seen for some time, a fortnight perhaps; when reaching, the fingers are now fully extended, and then flexed quickly. Laughing, "talking," etc., seem to be much inhibited now by her interest in things, by her activity in observation. She makes now no objection to drinking cold water. Simple new combinations of vowels are heard daily at the present time. While impossible to define in terms of language-vocals (so rapid and so confluent are they) these sounds often have a striking resemblance to words and phrases, both in quality and in rhythm.

145th DAY. L. noticed her foot today as a convenient object, grabbed it in both hands, and put her toes into her mouth as she might any other suitable object.

146th DAY. She still fails to discriminate an object offered to her from the holding hand: I held out to her today repeatedly a small bright silver vase with my fingers extended so that it was as easy to take the vase as the fingers. She took either one or the other, apparently just as it happened, often not touching the vase at all.

This confusion may well have been both perceptual and motor: she may have failed to some degree to discriminate the bright vase and the hand, but doubtless the lack of coördinating adjustment was largely at the basis of her failure to take the object. Squirrels in being fed from the fingers are all too apt to exhibit this same lack of discriminating analysis, but in their case the lack may more reasonably be ascribed to their normal far-sightedness. See Day 146.

L. tried repeatedly to pick up the brightly colored pictures from the cover of a magazine, and quite as if such colored surfaces appeared as solid to her as any familiar object with three dimensions. She looked at the new golden moon in a silvery sky at twilight—perhaps the first time she has noticed the beautiful moon. She looked round quickly at the sound of someone opening the door, and more quickly than at other sounds, as if this were associated with the coming of someone. When she and her bright ball were both held before the big mirror, she looked at the ball and its reflection alternately, but most often at the ball. She does the same with regard to a person holding her up to the mirror, often making a great effort to look up into the real face of the person holding her.

Here is a process of direct comparison of an object and its visual image—noted by Preyer for the first time in the twenty-sixth week. It may be worth while to note this as the first known cognizance by L. of similarity. (See notes of Day 22.)

147th DAY. L. tried to stand today when in her nurse's lap.

End of 21st Week.

148th DAY. The association between the noise of the clapping of hands and their movement as seen, lasts now a few seconds only,—that is, she winks at the feint.

This seems to be in L. the period when psycho-motor associations are actively forming into the understanding of the relations of things in space by causality.

L. evidently associates a person's hands with the face of that person, for today when hands were offered her from behind, she immediately looked up

to see whose they were. Faces appear to be the most interesting of all objects to her; she watches them much. She made vain mild attempts when hungry to open her mother's gown; this perhaps was accidental, designless, but more probably was another sign of an association connected with a strong biologic satisfaction.

149th DAY. L. dropped her rubber doll, etc., twenty or more times in succession today, often watching it fall and looking at it when on the floor. This implies the presence of a memory of having seen unsupported things fall, for she did not actively throw them down, but merely deliberately opened her hand so as to allow them to fall.

Without regard to the memory-image of falling objects, this repetition of movements and acts is the voluntary usage of the rhythmic tendency seen especially in so many reflex processes. In both cases the repetition is undoubtedly due in part to the felt pleasantness of action as such, but in particular to an innate impulse to the perfection of the psychomotor habits that make up the child's self-education at this period of life. It is impossible, moreover, to doubt that some element of conscious wonderment and experimentation entered into this persistent series of actions, especially because they were so purely voluntary in their nature.

L. plays with things in her lap freely now. She cries of late only when hungry. She sees herself in the mirror and often looks 'round to compare the face of the one holding her with its image. Sitting in one's lap, she seems to have as yet no invariable understanding of spatial depth, for she repeatedly tried today to draw her mouth, (prepared with the lips protruded), down to toys that she had let fall or thrown upon the floor, but did not reach her hands or body toward them at all.

The spatial problem is shown to be complicated beyond easy disentanglement by this failure in the use of her arms to reach for much-desired toys on the floor—unless indeed we suppose that she here "reached" with her lips as truly as she certainly did on Day 74 with her arms. If a child's motor attention can be so completely on one mode of doing a thing that another and more common and efficient mode is entirely ignored, then the latter alternative is undoubtedly the explaantion here, and indeed it seems the more likely explanation. At this stage of motor development especially it is obvious that one pathway of muscular innervation would be more ap tto absorb the attention than later when, owing to the increased complexity and clearness of personal purposes, the final result rather than the means is in mind—the means then taking care of themselves. See Day 211.

L. uses the left hand voluntarily almost exclusively now. She shouted in pure glee many times today. She still allows herself to fall far sidewise when sitting up, but forwards only as far as she wishes and never backwards. She cried a little after hearing the piano played for a time. The caressing of her feet by someone seems to give her great pleasure. She has never yet made any conspicuous efforts to draw herself toward the breast; now, as ever before, she lies on her mother's lap and kicks and cries when hungry until applied, merely turning her head in the right direction.

150th DAY. Having seen a visitor's grotesque efforts to amuse her awhile, she obviously remembered it a considerable time for she repeatedly smiled and snickered, afterwards, while looking at him. There seemed to be a time this afternoon when she was "thinking" about her toys that she was continually dropping, for she had for a long

time a smileless, pensive air quite as if mentally engaged with representations within.

Perhaps this was the beginning (so far as indicated by negative motor reactions) of conscious conceptual association. It gave the observer an impression of revery rather than the later-coming process once termed ratiocination. See Day 237 for evidences of an internal process somewhat similar but more complex and more motor, and less a passive association.

Another supposition, namely, that this experience was mentally restful rather than active, is, of course, easily possible. But the facial expression belies this explanation to some extent.

153rd DAY. L. is five months old today. She tried repeatedly to pick up a pictured frog cut out and pasted on a large white sheet of cardboard.

It is these attempts to treat as solid plane representations, and these practically alone, that throw doubt upon her clear conception of spatiality. So many elements enter this attempted picking-up of pictured objects, however (such as defective vision, realism in the picture, caprice, auto-suggestion, play), that the objection seems incompetent. Any one of these conditions might have led her to try to pick up the pictured frog, although she was conscious all the time that it was not a solid object. Here there is danger of over-analysis.

Now, as previously, laughing aloud always causes an attack of hiccoughing.

Both laughing and hiccough are basally spasms of the diaphragm—the former clonic and the latter occasional. To explain the nerve-paths of the latter we must unravel further than as yet has been done that formidable series of knots of nerves known as "the sympathetic."

Have not been able so far to induce imitations of any sort with certainty, although it seems as if

sometimes simple muscular movements of the arms, etc., were imitated after the long latent-period of two or three seconds. Voluntary supination of the left hand as well as of the right is now partially accomplished by much apparent effort. When she is given a little wet cane-sugar she works her taste-organs, especially her tongue, very actively, just as a young calf does under the same circumstances. This sensory impressions so made on the stomach always stops hiccoughs at once if they are taking place.

154th DAY. L. smiled repeatedly at the odor of sweet-smelling incense which was burned near her. She is noticeably more capable with her head-movements than formerly, for she threw her head far back so as to see Amy, her nurse, when the latter spoke while standing behind her; and several times of late she has twisted her neck with great freedom and agility to look at objects. She followed with her vision a red spool on a string swung before her face (its single vibration-period being about 0.75 sec.), but she did not quite keep it in sight, except for only two or three swings. She often tries to pick up pictures as if they were solids. She nosed 'round her nurse-maid's dress for some supper, but when her mother came to her she was recognized instantly (apparently by smell) and L. whimpered. She uses her left hand now very much more often than the right. Her present reaction-time of turning the head when spoken to, etc., is about one-and-a-half or two seconds.

End of 22nd Week.

155th DAY. L. obviously did not see one of her mother's hairs when presented to her on a large

sheet of white paper, not even when it was tied up into a knot of considerable size. This test of visual acuteness was tried repeatedly at two different times, and with the hair at various distances from her eyes, but always with negative result, probably, for she attempts to seize everything that she sees that is within reach. A coarse pencil-mark on a card was also not noticed. When this mark was enlarged into an (uninteresting) area four by six centimeters in size she made no attempt to seize it either; pictures, however, of like size, are usually grabbed at promptly.

158th DAY. It is very interesting to realize (as is readily observable) that psychophysical development proceeds appreciably from day to day, yet for the most part in a way scarcely definable. She is, however, sensibly brighter, more sensitive, more observing, more persistent, and more capable with all her muscles (both as regards accuracy and speed) every day. She now never cries save for sufficient cause. About now when one might "naturally expect" vigorous flexor back-movements directed toward sitting up, one sees here instead today repeatedly extreme movements of extension of the back that amount almost to opisthotonus.

The theory that allies flexor movements in emotional reaction with unpleasant emotions and extensor movements with pleasant emotions would suggest that these vigorous extensor motions of the trunk were learned first because more pleasant than the flexor movements. Such an attempt at explanation here would be obviously inadequate. This backward throwing movement is common enough in children, especially an as "expression" of anger, but in case of L. it had no such relationship. It is likely that they must here be classed as one of the numberless practice-habits that go

and come in this transition stage between reflex and deliberate motor life.

L. seemed to associate her rubber pig thrown across the room with the person who threw it, for she looked from one to the other repeatedly. She often holds out her hands, now, one or both of them, when no object is presented, but not for the purpose that they may be taken, for that always surprises her slightly. The reaction of surprise is very well defined on her face frequently. The frown has been conspicuous the last day or two; it comes apparently from perplexity usually, and less often from chagrin; it is caused largely by the corrugator supercilii. She had her first valentine today, from her mother; she handled it a little and then threw it on the floor. She obviously missed the water of her bath when she was put with her clothes on into her empty bath-tub. She seemed to feel for the water with her hand.

159th DAY. When L. is hungry she makes chewing-movements of wide latitude long before she gets plainly impatient to be fed. This seems to be a very sensitive reflex with her.

These movements of the alimentary canal are very closely associated with the various mental phases of hunger (see once more Pavlov's work on the conditioned reflexes) and these jaw-movements were undoubtedly due to some part of representation of food in the reproductive imagination of the child's mind. See Day 161, etc. Here is an example of the exceedingly close association between mind and body and an intimation of the physical basis of the action of suggestion on the basal vegetative functions.

A piece of candy experimentally put within her lips causes them to take on the sucking-position with active "licking of the chops."

161st DAY. L. can almost set herself up today, requiring but very little help.

Miss Shinn's subject learned to draw herself up (unassisted) to the sitting posture in the thirteenth or fourteenth week, and the Moore boy in the twelfth week or soon after. Preyer's boy's twenty-second week saw the same rather definite act accomplished, and Preyer reports other cases as follows: Ploss, fourth month; Sigismund, seventeenth to twenty-sixth week; Frau von Strümpell, nineteenth week; Heyfelder, fifth to sixth month; and R. Demme reported that the "average child" sits alone at the ninth or tenth month. It is obvious that unless we know whether the child had assistance or not these comparisons are idle. How many of my readers can set themselves up from a supine position without the use of the arms?

L. is exceedingly jolly this afternoon, shouting and laughing boisterously at her mother's attempts to please her. She certainly knows her name perfectly now at least, for when being entertained well she would turn her head only on hearing it, although other things were announced in still louder tones. She has still the habit of chewing, noted the day before yesterday, and it is due to other things than hunger sometimes, probably, e. g., teeth. Her tongue was seen turned on edge many times today.

End of 23rd Week.

162nd DAY. Her mother was away from L. six hours today and when the latter saw her again she laughed aloud and long with delight.

163rd DAY. She did not show any signs of "fear at a gloved hand," but freely grabbed mine today. She looks at familiar objects actively now as if studying them,—for example, my shod feet on the floor. She enjoys very well a few drops of orange juice. She shouts much of late when gleeful, in a

rather monotonous high-pitched āāā. She looked at her image and mine in the mirror today with an unmistakably mystified look, if a frown indicates that. She made no sign of dislike to a rather strong odor from a box of tobacco.

168th DAY. There has been an appreciable gain in intelligent activity the last few days. L. likes her old red-and-yellow rattle best and selects it every time from her basket of numerous small toys. When her bottle was offered today she instantly "made her mouth go" and reached out her hand toward it. She is very left-handed now. The voluntary grasp is still much slower than the reflex grasp-reaction occasioned by the touch of an object when she is not looking. She cannot as yet quite raise herself from the horizontal (supine) position to the sitting posture; but she needs only a very little help; she does not fall over when she is set up. She likes very well to suck one or the other of her big toes. She readily noticed a very slender eye-glass chain.

End of 24th Week.

169th DAY. I have not been able to get any clear and direct signs of the conscious imitation of any simple act so far; laughter she "takes" from one laughing, but this is general and reflex, and does not count here as a true "voluntary" imitation.

171st DAY. It seems today as if the tendency to voluntary imitation is about beginning now, for at times there is a slight suggestion of her imitation of mouth-postures and movements.

There is a difference in the manner of voluntary imitative movements and those of a reflex sort that is more easily felt

than described. Perhaps the chief characteristic of the former sort of movements is a groping, uncertain hesitation that is different enough from the mechanical reactions of a trained reflexly acting neuromuscular apparatus. More than this, however, made it seem proper to place these movements of vocalization as the first voluntary (or "conscious") imitations of this child: In the first place the actual postures and movements were of new sort from any before seen. They were more complex, too. Furthermore (if we may be pardoned a deductive argument) one would expect to see in the lips and tongue the first consciously imitative expressions, not only because they are the first of the motor mechanisms that function for the first time after birth to develop, but because they are at once the most sensitive and the most useful of instruments to the child in its universal endeavor to comprise its environment. Reflex imitation of gurgling was observed as early as Day 59, while on the other hand deliberate imitation of a complex act with the arms was not obtainable before Day 231—the end of the thirty-third week. Voluntary imitation of hand-wavings occurred on Day 194 — certainly an act of average complexity and deliberation. From the moderate coalition of the neuromuscular mechanism, then, at the beginning of the third month onward throughout life imitation of perceived behavior in others is one of the guiding principles of individual evolution.

Preyer was not sure of the voluntary imitation of mouth-pursing before the seventh month. But so late a date is more or less inconsistent with the time he sets for the beginning of voluntary movements.

At sight of Mrs. J—— (whom L. "knew" very well when she was from two to six weeks old) it seemed as if she remembered and recognized her, for she did not stare at her as she regularly does at strangers but on the contrary dimly smiled at her.

I know of no precise data on which to base any knowledge of the very early memory for still earlier experiences. Can an average child twenty-five weeks old remember a woman's face very familiar for the month extending from the second to the sixth week? The evidence for an affirmation of this question is good in this case, the facts as stated in the text being reliable. This evidence is offered for no more than it is worth, and the physiologic basis of memory is as yet too vague to warrant an opinion either way. With all the recent advance in the knowledge of the nature of the nervous impulse the data of memory-traces in the neurones are wholly lacking. See Day 452. See also Tracy.

The use of the arms especially has advanced the last few days in quickness (particularly mornings) and in the ease with which L. reaches her hands over across in front of her body.

On the general principle of the recency of nervous rest L. (who seldom slept in the day-time) usually was noticeably more capable in the morning than late in the day, except in those acts that profited by immediate practice. Most of us are well aware that the quality of our work is better in the forenoon than towards night.

L's new habit of crying for toys taken away from her until they are returned, shows perhaps the existence of visualization. She stretches out her arms when she wishes to be taken up, unless this be taken as a reach for one's face. She is very sensitive to sounds as she always has been. Once today when near a corner of a room and someone spoke to her unexpectedly she looked first toward the corner then quickly in the opposite direction whence the sound originally came.

173rd DAY. Imitation is today slightly more apparent. L. has a voluntary habit the last two days of blowing saliva from her mouth at times. Shrug-

ging of the shoulders has begun;—yesterday, perhaps. She is not afraid of strangers in the least. She is not contented with other toys when she has been deprived of any particular one; this proves representation of absent objects.

End of 25th Week.

176th DAY. Someone played peek-a-boo with her today for the first time with success,—that is, she now seems to understand and to look for the "boo"-part. Shrugging of the shoulders is now less common than it was three days ago. Her bath does not hold her attention as it formerly did—she now looks around, and smiles evidently because of the pleasure of the warmth on her skin. Of late the "fear" or depressing discomfort of the dark seems to be developing—at nightfall she cries, but stops at once when the lamp is lit.

This fear of the dark is an instinct from der Urzeit, if there be any in the human mind, from the dim and distant past of man's evolution when, without artificial light, darkness was a reasonably fearful source of danger to him. In L's case the "fear" came with absolute spontaneity, lasted a little while, and departed never to return. Imagination in her case could have played a part only on the supposition that the process created fearful images out of ordinary elements that had entered her consciousness—blots, as it were, on Locke's tabula rasa—for no picture or word of darksome things had ever afflicted her mind from without when this depressive fear of the dark began.

It is more likely, as is observed not infrequently in nervous women, that this "fear" thus early is physiologically merely a depressive influence exerted through the eyes on the brain It then might be supposed to develop when the brain had become sufficiently complex, and to be overcome when intelligent inhibition had made this repression possible. Major's

tendency to doubt the reality of fear during the first year is, however, apparently contrary to both observation and emotional theory. Reactions like those noted in her fear of the noise of putting coal into the cellar are not to be mistaken for anything other than real fear. Its instinctive heredity we may well doubt.

L. was frightened today also by the loud noise of putting in coal under the window; each time a basketfull was turned in, her attention was engaged to it, then in about two seconds she would cry and cling convulsively to her nurse's neck, etc., in a way not before observed.

She already stands well except for the essential balancing. When she is held up naked the walking-reflex movements are fairly perfect, although the alteration is not very continuous. She grabs hold of people's hair and clothing with no little self-assurance.

She drinks well out of a cup, holding it steadily to her mouth. A spoon also is properly used.

178th DAY. L. for the first time showed undoubted fear of falling while being carried upstairs. She was looking down the stairs and clung convulsively, unmistakably afraid, to the neck of the person carrying her, as she did two days since in her fright from the loud, unfamiliar noise.

Preyer reports this as occurring in his boy for the first time in the fourteenth month, and Prof. Major in the latter part of the nineteenth month.

She greatly enjoyed her trip outdoors, laughing out of sheer delight at the sunlight and cool air and the new things to look at. She now uses both hands, but the left rather more readily than the right.

179th DAY. For the first time L. discriminates

one's eyeglasses as a separate object when on the nose, for today she takes them off herself, whereas heretofore although she has liked to play with them when swung before her she has seemed to lose sight of them when they were replaced on their owner's nose. She recognizes an orange at once now as good to eat as well as to look at and play with, and obviously "asks" her mother to open the orange when one is given her. She does this by a certain sort of eager attention to the orange and her mother at the same time, as one often sees done by dogs and monkeys; when the orange is taken apart she likes to suck a pip a little for the juice. She shows still some signs of fear or dislike of piano-music when held very near the instrument; (see the notes of a month ago).

180th DAY. Lucia is one-half year old today. She went out twice to ride in the warm March sun. She has developed the last few days a sign to use when she desires any object, such as an orange or her flag. This consists of a voluntary short, straining, crowing cry (a loud expressive grunt) accompanied by the extension of the arms and often by a certain posture of the mouth. This expression of desire may be repeated often when she's delighted. This feeling-reaction, almost talking, is quite new today and yesterday. She has another curious habit observed only today: when her mother holds out her hands to her and says "Come!" she vigorously blinks both eyes at once several times in quick succession and makes her "remarks." She now kisses, bites, etc., one's face and hugs tightly,—all clearly defined and complex voluntary actions.

End of 26th Week.

183rd DAY. L. laughed aloud in her sleep this morning after a good meal. Her blinking-habit when she greatly wishes a thing is still strong. Her expressions and manner when one puts his eye-glasses on her nose are comical enough—due to the unusual sensations.

She consistently picks her bright-red celluloid rattle-ball (two-and-a-half inches in diameter) out of a basket of toys. She obviously likes this color best of all; the ball is green on the other side, and when held that side toward her does not attract her.

This bright green and this red were alike approximately in their reflected brightness, so that the discrimination-criterion must have been the color-tone—the redness and the greenness as such.

184th DAY. L. tried to creep this noon of her own initiative while on a sofa; when placed on her quilt on the floor in the proper position, however, she could not support herself on her elbows or hands and made a complete failure of the desired action. She recognized through the chinks of my fingers her morning's orange and asked for it emphatically with her straining crow-signal.

In this reaction the memory-image of the pleasant orange was recalled to her vividly by its mere color; its shape she could not see.

The grunt or crowing accompanied by a diaphragmatic pressure on the abdomen (together with contraction of the abdominal muscles) so often seen in young infants as a symbol of active desire is perhaps the result of restraint of feeling-innervations in the cortex, finding vent more or less accidentally in these peculiar effort-reactions. On the other hand abdominal effort is perhaps that one most familiar to the infant from the first as part of a vegetative function.

Another possible explanation of the source and physiologic meaning of this habit is given under Day 202.

187th DAY. L. keeps her left leg swinging contentedly now part of the time while she is nursing.

Inasmuch as this motion of the leg would promptly stop unless voluntarily continued, there is here an illustration of the early splitting of attentive motor consciousness, for it is hard to think of nursing as ever devoid of conscious attention; at L's present age its inherently voluntary elements are everywhere conspicuous to the observer.

L. had an half-hour's "singing"-period this afternoon. When one taps her bare legs or feet she obviously feels it and now shows interest in the sensation, which is something new. She at once today saw a fine long hair held six inches before her and grabbed hold of it; she started to do the same thing when the fingers were held in the same way but without the hair, but stopped, not seeing the hair. (On the 155th Day she did not notice even a knotted hair on a white sheet of card-board.)

End of 27th Week.

190th DAY. She grabbed hold of her mother's dress in front to prevent herself being laid down to go to sleep.

191st DAY. While being carried out of doors, by her nurse, L. looked quickly round at hearing a ragman's absurd cry in a way which made observers laugh aloud; this indignant look and sudden head-turning is quite characteristic of her and I believe is directly hereditary from a great-grandfather.

192nd DAY. She today tried to take the eyeglasses placed there by me, away from her nose—the first time; heretofore she has only seemed sur-

prised and disturbed. She looked at her mother with glasses on in a clearly mystified way.

While she was loudly crying tonight, waiting tired for her supper, someone made her laugh aloud in its midst so that the cry and the laugh were almost indistinguishable, at times quite so.

The respiratory physiology of laughing and of crying are nearly identical, although the facial muscles are innervated in very different combinations in the two opposed emotional states.

L. was very talkative and jolly today and made joy out of everything she saw. No deliberate imitations were obtainable.

194th DAY. When she sees a person go past one of our front windows, she now looks out of another window to see him again: expectation. Imitation of waving hand-movements, etc., is apparently now beginning.

Three days since no signs of any voluntary imitation with the hands were obtainable, but to-day this particular movement of hand-waving is feebly accomplished. This is properly a voluntary movement and is doubtless more difficult for the child to perform when the stimulus is the movement in another person than were the act impelled from within by interested desire of some sort. This particular movement is highly symbolic and it was not until Day 270 that it was deliberately and spontaneously used as a good-bye signal.

Today, capriciously, she uses the right hand now as readly as the left for most purposes. She obviously enjoys the change of being somewhat roughly handled for a little while. See Day 49. When she came in from her outing this afternoon she was in a strikingly joyous mood, evidently ready to

laugh hilariously with or without a cause save that of her own gleeful mood;—so much for the sthenic effects of fresh, cool air, the spring sunlight, and a change of scene upon a sensitive organism.

Actual demonstration of this stimulating and truly invigorating effect of these commonplace but inestimable physiologic influences on the individual (most conspicuous, of course, in a young female child) are worth the noting. Their importance for the normal evolution of the personality it would be hard to overestimate, but this importance is often underestimated and neglected. Under-exercise and under-exposure kill as many children, perhaps, as does even bad milk! Of over-exercise there is little or no danger in the child owing to his freedom to recuperate in the automatically arranged sleep; over-exposure, on the other hand, is only a fad and little likely to do harm on a large scale because most parents have commonsense. What the child most needs is plenty of free exercise in the sunlit hours, plenty of sleep in the sunless hours and plenty of fresh air both day and night.

196th DAY. The most noticeable advance that L. is making now is in the direction that may be termed self-possession. The personal "will" is appreciably taking its proper directive office. She no longer reacts to stimuli in a certain invariable way; her attention continually becomes more and more voluntary and less reflex in control. It is curious that now as always heretofore any part of touch or of restraint of her hand causes its withdrawal irrespective of any tone of unpleasantness the sensation may have, e. g., the soft, velvety touch of a pussy-willow catkin occasions this reflex reaction.

End of 28th Week.

197th DAY. Someone put a tissue-paper fool's-cap on L's head (part of it extending far enough

forwards so that she could see it plainly), but she could not reach it with either hand at first attempt, and acted as if she thought it further in front of her than it was; this raising and flexing of the arm was a new, voluntary movement for her. She looked Miss R—— (whom she had never seen before) straight in the face a minute or so steadily, and then burst out into crying—her reaction-time for the conception of strangeness plus that of the emotion; they soon became acquainted with each other.

200th DAY. L. cried repeatedly today at a strange gentleman with white hair. She sleeps now with her arms stretched out, not flexed as formerly,—little or none in the day-time, but well at night. If an orange is sour, she now refuses its juice. Her pressure-grunt as a sign of desire is very prominent now, as is also the extreme extension of the trunk, neck, and legs, as an expression of obstinacy.

202nd DAY. L. tries to creep as often as she gets a chance, but does not know how as yet. She reaches down toward the door-knob on being carried to a door to pass out. She likes to play with my watch, to fumble around my waistcoat, but does not know how as yet to pull my watch out of its pocket, although she tries to do so. She uses her left hand much more readily than the other, sometimes, now. She amuses herself with crumpling and tearing some brown tissue-paper. Grunts of desire and short sighs of satisfaction are now observed many times a day, having become quite habitual.

These grunts may possibly be taken as more or less chance manifestations (made habitual) of the recent acquirement of voluntary control over the respiratory bellows-movements.

Without the power of varied control over this mechanism normal evolution of the expression of language in speech and largely the language itself would be impossible. They are then practice-movements for the future function of speech from this point of view. But see Day 184 for an explanation perhaps more likely.

When L. hears the noise of an opening door she always looks toward it quickly to see who it is that comes. She did not cry at a second visit of the white-haired gentleman today. Her blinking-habit is today nearly or quite missing, but a rapid chewing-movement is now made apparently in its place: —sthenic reflexes of joy. (But see Day 211!) She never even touches her ears now. (See Day 52.)

End of 29th Week.

204th DAY. L. has just learned about pockets and their sometimes interesting contents, and examines mine regularly whenever she has a chance. In her attempts to creep after an object in front of her she now supports herself on her hands well enough, but her leg-action causes her to move backwards rather than forwards.

L. never had but a little chance to practice creeping and in consequence could not thus propel herself forward until the fifty-fourth week. The retrograde motion noted here was due to her exerting a greater weight on her legs during their backward extension than during their subsequent flexion—a matter of relative balance on arms and legs.

Miss Shinn reports creeping in the early days of the ninth month, Mrs. Moore early in the eleventh month, Major's R. near the middle of the eleventh month, the two latter creeping forwards, the other, like L., backwards.

The exercise of rolling rapidly from side to side, like all other active movements, is evidently pleasurable to her. Vocalization occasionally shows a

series of vowel-sounds that are remarkably clear and sharp, in fact as perfect as an adult could produce and in tone even clearer. She objects now to riding in her carriage and cries until taken out of it and carried in the arms—this she enjoys greatly: another complex habit-psychosis.

210th DAY, Thirty weeks. It is hard not to believe from observation that some beginnings of a "moral sense" are not already developing in this personality—or at least something that determines conduct as ethical ideas might. E. g., if one says Naughty! etc., when she starts to take off one's eyeglasses, she stops and looks in a characteristic way.

The writer is strongly of the utilitarian "persuasion" in his ethics and has little belief in intuitive morality, and on this account the occasional signs of some degree of inward compulsion ("oughtness") have interest. If nothing else obtains, there is a regard for authority in this case not easily explained on an empirical basis:—she had had no experience of punishment. The writer is of the deliberate opinion that in this average child, at least in the thirtieth week, the germs of a feeling of oughtness are present, if motor reactions are any index of "mental" content.

L. uses her hands continually better. She laughs all day at every thing or merely, oftentimes, at nothing—in short, from the mere psychophysical joy of living;—alas that such health and well-being could not last all through the life of man!

End of 30th Week.

211th DAY. L. still has the occasional habit of blinking rapidly four or five times in succession when she is very joyful or contented — a sthenic rythm; sometimes the jaw works in the same way,

and (especially when a little tired and sleepy) she creaks loudly and rhythmically.

These rhythmic reflexes, very conspicuous about this period, may be taken perhaps as the finished condition of the clonic movements noted on Day 112 and very often seen about that time. With all the discussions of rhythmicity in all sorts of relations, its actual physiology is apparently still vague—awaiting perhaps real information as to the nature of the nervous impulse and its relation to the nerve-centers and to muscle more definite than the present theory of negative electric variation by the progressive aggregation of protein groups (ten years ago suggested by A. P. Mathews, now corroborated by many hands).

I tried to make her pull on the coarse string attached to her toy elephant, but although she took hold of the string she could not be made to understand how to pull on it—this relation of action apparently at a distance is not yet empirically understood. She has learned to brace herself, while sitting, on her hands, and falls now only obliquely backwards and sidewise. When any difficult because new movement is to be made with her hands and arms, the latent-period is often as long as from four to ten seconds, and then the movement is made very quickly in a way which seems half "spasmodic." Sometimes, indeed, it still is distinctly clonically spasmodic, three or four similar movements following quickly one voluntary innervation.

Her behavior under these circumstances is quite as if there were an indecision which is resolved rather suddenly at the end of this long and variable latent-period. A physiologist could hardly refrain from trying to translate this appearance in terms of the nervous impulses, as if the nerve influences from or to the muscle-groups required some such time to force their way along paths then newly connected,

but when the requisite complicated channels were at last opened that then the motor impulse made its way freely and repeatedly as if under something corresponding to pressure. In Morat's useful (and self-explanatory) term, the *viatility* of the outgoing paths from the Rolandic region constitutes one part of the difficulty and slowness of new voluntary movements, especially in the evolving infant organism.

More, however, can be now reasonably proposed toward a theory of the acquirement of voluntary control, whether it be in the baby of five months' learning to seize and hold her doll, or in the scholarly amateur, for example, learning late in life to engrave in copper. The one chief line of advance in the theory of voluntary movement lies in the general consent, although variously stated, that the neuromuscular mechanism is functionally always a unit. In other words, the muscles and the motor centers are mutually dependent. In still other terms, and more explicit, the muscles furnish influences, if not energy, to the nerve centers and this energy those centers use in turn in coördinating and directing the muscles in ever-varying combination. There is probably then something of the nature of a circulation round from muscle to center and to muscle again, the nerve-plexuses meanwhile storing up energies that they may expend in forcing new paths through this trackful maze of the nervous system. The personality in getting hold of this energy stored by months (milleniums?) of "reflex" activity, exercises its "will," performs more or less rightly and more or less skilfully and gracefully, a voluntary movement, simple or complex. These circulatory paths, figuratively at least, and reasonably enough literally, radiate further and further toward the cortex cerebri as the neurones connect. Thus perhaps the dominant mode of action, at first reflex and autochthonic, becomes a little later instinctive, and then, during the last part of the first and in the second year, truly voluntary, occurring after deliberation.

(See the discussion of Attention referred to at the bottom of page 15.)

On the theoretic psychologic grounds that the "dim consciousness" of infants is more subjective and by consequence less objective than the adult consciousness, it might be supposed that in forcing a new voluntary movement the kinesthetic sensations (motor ideas) were relatively prominent in the mind of a child of about this age. The lack of discrimination of small objects that she tries to take suggests this; so does, too, the long latent-period of new deliberate acts. On this basis, physiologically as well as psychologically, the real difficulty of such a new movement lies chiefly in a clarification (coördination) of the afferent rather than of the efferent nerve impulses, whether at the hypothetical "synapses" of Sherrington or elsewhere it matters not. Differential information concerning the kinesthetic sense-organs in infants would be perhaps of great use in working out the real nature of the development of voluntary movement.

The accuracy with which L's hands can be definitely directed is still moderate, and in some rarer actions small. It is curious that in taking up her little rubber ball, e. g., she sometimes puts her hand under it back up and tries to lift it on the backs of her fingers. At other times she grips it hard between the thumb and the fingers—much harder than were needful.

As for the attempt to pick up her ball on the backs of her fingers it is clear that the general intention (in this case to take the ball) is here shown before there is present in the mind any definite knowledge of her means of carrying out the intention. Desire (feeling) precedes understanding (cognition), and the method of accomplishment is at first more or less accidental until experience of unfitness by exclusion forces the easiest way into the neuromuscular habits of action. See Day 149, when (two months ago) her attention was obviously more on the method than on the end to be attained. In neither case were both the end and the best method clear in her nervous system. This is one criterion of infancy.

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—when one considers any such universal activity and then tries to think out its anatomy and physiology in terms of named or namable nerves and muscles, then one realizes how inadequate indeed is the anatomic point of view! Of course there are anatomic parts, nerves, muscles, glands and the rest, doing all these wondrous things, but knowledge of them gives us no more real understanding of bodily activity than our sight of the stars on a December night gives us of the unending infinities of space they are pushing through. And *understanding* is just the one important thing, for it presupposes that more or less concrete notion of wholeness without which facts are of little use. It isn't only a matter of "learning to wonder," but it is, in addition, a prerequisite of broad and true physiologic knowledge.

The possession of this real understanding of our actual universal bodily activity makes no whit less important a detailed histologic and anatomic and biochemic knowledge of the mechanism of our efficiency. On the contrary, this appreciation that these massed waves or tides of nervous energy correlated with waves or tides of contractility represent best that obvious continuum of universal movement that is the bodily life of man and other animals makes even more necessary than before (and infintely more interesting) the detailed anatomic knowledge of the means by which the surprising effect is produced. It serves as a rational ground, as an outline whose details it seems necessary to fill out, and now with some hope of success. And the more complete our knowledge of the anatomically separate facts the truer we may be sure will this generalization appear to be, because the correlation is at once below and above, antecedent and consequent, to its details.

L. always unties her mother's neck-scarf while nursing, and today made imperfectly the same movements when mostly or quite asleep.

Such psychomotor movements as these, of course, imply that active consciousness (in a "split-off" state) which we know as dreams.

A crumb of maple-sugar put in L's mouth caused her to rub her gums and lips with her tongue much as I once saw a young calf do when it had just tasted sugar for the first time; but the child showed none of that extreme lively eagerness for more that the calf evinced by jumping toward me, etc., indeed the former merely grunted at the pieces remaining in the dish. (This reaction to a pleasureable taste was in no wise different from what it was on Day 153.) Her feelings are very easily hurt, for she cries violently when her mother laughs at her, although never when we laugh with her.

This discrimination in the different motives underlying two practically identical emotional reactions is striking enough, for it means that in apprehending this difference she already understands at least one complex mental relation.

This is a good illustration of the wide-spread subconscious acquirement in early infancy of the understanding of complex social relations, and especially of complicated emotional reactions in herself as well as in others. It would be hard to define in physiological terms how laughing at one differs from laughing with one. Perhaps the former implies in her the subjective feeling of ridiculousness, the latter the presence of the very different feeling of joyful sympathy. But note how sensitive is the organism even of the infant at thirty-one weeks to the objective physical signs by which the two are discriminated! This is always an instructive marvel—this inborn understanding of emotional symbols as produced by organic reactions often of a very subtle kind. The more highly evolved of the brutes too, of course, understand them more or less. See Days 262 and 273.

The rubbing of her fingers over the bristles of her hair-brush makes L. shiver and withdraw her hand from it vigorously.

215th DAY. She now kisses properly when asked to do so, but makes her jaw go in an exaggerated manner. New, funny faces appear every day, and she is very sensitive to ridicule on their account, crying when one laughs at her.

216th DAY. Accustomed for some months to look around from her bath at her nurse, L. stills does it habitually although the maid is no longer there.

217th DAY. Grimaces and "faces" are still more marked and vigorous today than yesterday, and involve about all her facial muscles at times and especially the orbicularis. They are usually symmetrical, but sometimes the mouth is distorted to the right side together with the tongue. These reactions may be classed as joyful practice-movements. L. was not at all afraid of a strange young lady today. She slept outdoors two hours and so soundly that she waked up very slowly when brought into the house.

End of 31st Week.

218th DAY. Someone gave her a bunch of keys to play with for the first time: at first she would not touch them at all, then touched them very "gingerly," immediately drawing both hands far back to her side (an instinctive protective withdrawal), but in about ten minutes she handled them noisily with her usual freedom.

How similar is the behavior of kittens and even cats momentarily under these conditions need not be suggested. This instinct of self-preservation receives illustration continually in the behavior of the young. Adults act similarly, some of them in the presence of comets, and all men, more or less, when the unfamiliar experience death comes to them.

L. this morning attempted to creep as a spon-

taneous tendency without any object to creep towards and secure, and several times she did so when an object was beyond her arm-reach. She has not advanced much in this activity in the last week, having had very little practice at it. She holds herself up on her arms better than formerly, but the effective leg-action is still all but nil. She spontaneously holds her hand out toward a person now when she is sociably inclined. Having something in the hand with which alone she could conveniently reach something else offered her, she today first extended the filled hand and then reached back, dropped the object deliberately, and then used the hand as she desired. She noticed immediately today a fine short hair held before her face, and tried to take it.

219th DAY. Although always much delighted with my watch when, over and over, it is pulled from its pocket and given to her, L. does not as yet imagine it and search for it herself. Today she has carried her large bright rubber ball in her hand almost constantly. She clearly does not like the feel of very soft objects like cotton or wool.

220th DAY. L. now shakes her rattles deliberately to enjoy the sound (and the exercise?) Having left her ball lying in her lap and looked away for ten or fifteen seconds, she missed it when she looked back and searched for it—it having been "surreptitiously removed." She watched the process of adults eating at the table with great interest and attentiveness.

221st DAY. Recently the sounds mamma have appeared in L's vocal and it is almost certain, spontaneously rather than imitatively or on a memory-

basis, for she has never heard spoken, so far as can be learned, even once, the word "mamma." It even seems as if she used this word more when she wished her mother to come to her than at other times.

So far as this word is concerned, then, language was primarily in part the outgrowth from spontaneous chance vocals. The possibility always remains that a nursery-maid or someone else may have used the word in her presence.

The lights and people at the dinner-table last night (a rare experience for L.) had a very exhilarating influence on her organism and she had a very boisterous attack of gayety and of laughing at little or nothing. She did not remember her rattle (she had it little for a week or two), for when it was given to her she was afraid to touch it as she is at first in regard to all objects. She watched an interesting gymnastic performance by some boys on a lamp-post with great interest, and apparently thought about it for forty seconds or more much as an adult might, for when her attention was at last by effort attracted away from it she was in a very different (more active) mood at once.

223rd DAY. L. noticed twice a fly that was flying about, and followed it with her sight. The sensations from a slender rubber strap around her ear she noticed immediately and at once she made a feeble attempt to remove it; later she seemed to lose all awareness of it. She was delighted by a brass band and a procession that passed by her, and "took it all in" through ears and eyes.

End of 32nd Week.

225th DAY. L. does not understand yet (see Day 211) that by drawing on a string attached to an object, e. g., her toy elephant, she can bring the ob-

ject nearer to her. She still dislikes exceedingly all high-pitched voices and such noises in general (as she always has), and they often make her put out her under lip and pucker up her eyes to cry. She turned over and over in her hand, and with a searching look, her ball formerly colored certain familiar hues but now changed by covering half with a white celluloid hemisphere. Red and yellow are evidently her favorite colors, but blue she does not seem to care for so much.

The behavior of L. on this occasion left no doubt whatever in my mind that she perceived some sort of differences in these primary color-tones of her toy. The preferences at this early age, I believe, cannot be accounted for on the convenient supposition that a child is bound to prefer to hold objects in proportion to their brightness, for the facts do not bear out the supposition, for example, in the case of very brilliant metal toys as compared with others. Repeatedly has spontaneous preference been shown by L. for yellow and for red (especially pink) objects during the first year. Perhaps the liking for yellowness thus early may have been in part due to its intensity or brightness, and her dislike of blueness to its relative low light-intensity. It is indisputable notwithstanding that color-tones were at least vaguely discriminated on Day 225, red beyond the shadow of a doubt. Preyer thinks that his boy could not discriminate colors before the eighty-fifth week.

All through at least her first ten years pink remained her favorite color.

L. cries to be stood up, very often—this is in her a strong impulse already. The attractiveness to her of new toys is very noticeable. The last few days she has developed a desire to be with her mother constantly and cries for her usually but only when she is in sight. The habit of making grim-

maces is mostly gone, but they are still seen occasionally. The blinking-habit, on the other hand, seems to be quite gone. No complex conscious imitations are observable as yet. She uses her left hand apparently now much less than the right. The soles of her feet are very little ticklish, tittilation causing only a flexion of the toes and a slight withdrawal of the foot. She knows how to use her hands now nearly as well as does an adult for ordinary simple movements of seizing and holding. She still picks up things together when she wishes only one of them—for example, she picks up her dress with her rattle lying on it; this seems to be due now rather to clumsiness of her motor choice than to any lack of visual discrimination. She was out in the rain for the first time today. The range of her vocals is noticeably larger and their number greater continually.

228th DAY. L. now knows how to draw things up to her by pulling on a chain or string—e. g., as today, my watch when it is out of her sight under her chair. She rises on her feet as often as possible. Having developed the habit of pulling other people's hair, she now often pulls her own, but obviously less hard. She understands and associates the meaning of at least one term: "Sweet kiss!" for when her mothers says this to her, she immediately grabs her about the face and kisses her impulsively, with a hug.

229th DAY. She is now beginning to get mischievious in the way of grabbing things. She cried today repeatedly when her nurse coughed.

This stimulus could scarcely have had other meaning to L. than that of loud and disturbing sudden sound, so that

the tears and other reactions came as the consequences of nervous shock. There was no sorrow or grief about it, we may well suppose! or proper fear.

L. is continually trying now to get upon her feet. Her articulation of mă mă is now very distinct.

231st DAY. Over and over this morning after I had pounded with a round stick or wand on a pillow, thus making a loud noise, she would take the wand and similarly shake it against the pillow. This is the first complex clear certain imitation that has been observed. There can be no doubt about this case, for this is an action that would not be made accidentally. Five times this experiment was repeated, and each time successfully. Later in the day she would not imitate the movement of shaking the hand to her.

The imitative movements of the mouth (Day 171) and of the moving hand (Day 194), both classed in our Table of First Appearances as voluntary imitations, have a somewhat different look so far as deliberateness is concerned from the series of movements combined in pounding a pillow with a stick or in putting the latter into a mailing-tube. One can suppose something approaching an inherited neuromuscular mechanism for vocalization and to a less extent for hand-waving perhaps. In books of child-observations it has sometimes been forgotten how very slow and gradual is the change between the reflex behavior of the first month and the quasi-voluntary conduct of the eighth.

The imitation of acts as complex as these first done today means much more than the readiness of a motor mechanism; it means, in addition, interest; attention; a certain accuracy of reflex observation and of memory; a useful (advance) clearness of the motor ideas of the act required; and an impulse, further indefinable, to do observed acts and thus to learn. These, it may be observed, are perhaps the leading

factors of general psychomotor efficiency, and the time when they coördinate into action, therefore, is an epoch in a child's life. On the preceding voluntary imitations of vocalization and hand-waving the interest, observation and memory might well be considered to have been much less advanced.

Mrs. Moore records a complex arm-movement imitation by her boy corresponding to this in the thirty-eighth week; Major in his boy R. near the end of the eighth month; and Miss Shinn in the little girl she studied at the beginning of the sixth month. There is, then, fairly close agreement as to the deevlopment time of this important efficiency in making complex direct useful imitations with the arms and hands.

There was another active period of babbling "talk" today, bām mām and bā bā being the chief vocals; but others also were frequent. They are now much clearer and more definable than they were in her last talking-period. Later today L. imitated also another act that was more complex than that, her first, noted above: her mother put a wooden stick into a mailing-tube and then pulled the former out with her teeth. L. immediately seized it and did the same thing; this, too, was repeated four or five times in immediate succession.

End of 33rd Week.

232nd DAY. L. imitated the whirling of the little wheels on her elephant, after she had seen someone do it a few times; she then did it very well several times. She drinks out of a glass well now, and is beginning to swallow deliberately and properly.

233rd DAY. When L. sees an object at a distance that she wishes, she now jumps directly towards it. This would seem to show that the general idea if not the motor ideas of locomotor ac-

tions are clearly present in her mind before their realization by the body is readily possible.

She listened to the sighing of a small sea-shell with much attention and strangely enough with expressions of no little delight as well.

Why such a simple sensory experience as this should make her laugh as it did it is not easy to understand. Perhaps the elements of unexpected novelty were the occasion of her obvious feeling of joy. In jokes the unexpected is, of course, a chief cause of the humorous effect. Here is direct physiologic evidence for the sthenic influence of novelty—a useful stimulant then.

235th DAY. She seemed to recognize Mrs.——, whom she had not seen for about seven weeks. The surprise that objects of which she leaves hold drop downward she now shows plainly.

Of course this possible feeling is shared with her by even the wisest and most learned. It is only now, however, that the occasion for wonderment has dimly entered, if at all, her mind. Here, as frequently, it is not by any means certain that her behavior is not of the play-variety—"pretended" rather than "sincere." And yet a germ of surprise might have been there. Preyer dilates on the none-too-obvious difference between surprise and astonishment, and relates that his child first showed the latter emotional state during the sixth month. "Staring at their own fingers with great attention" mentioned by Tracy as occurring in children during the first month is not the sort of experience observed here in L.

She has today a new habit of rapidly flexing and extending the figures of both hands at once.

This rather striking rhythmic movement is a good example of the numerous practice-movements that one by one develop in different parts of the body and then disappear. It

is by their means, of course, that the more frequent actions are graven in the plastic neuroplasm.

When instead of disappearing some more or less subconscious attention of the young individual causes them to persist, we have what Gowers calls habit-spasms—tics or "automatisms." Lindley classifies these into ninety-four varieties, including eight hundred and ninety-seven common movements. In general children of a "nervous temperament" show a great tendency to these some years later in life, especially perhaps in the seventh and eighth years.

In this connection it is worth noting, perhaps, how large is the number of different and separate movements even of children, and we may be sure that Lindley's classification is by no means exhaustive. Each of these movements represents the coördination of a set of muscles that is unique and each implies that the innervation of its set of muscles and nerves ("action-system") has already become more or less reflex, that is, narrowed and habitual. This very fact indicates that the central nervous system of these children is overburdened and in need of rest, combined with the largest possible number and variety of motor stimulations such as it would receive from free voluntary life out of doors, on a farm, for example, as far as possible away from the cramping conditions of the average city school-room. Thus still the too-long school hours of the public school in the lower grades wears harmfully on all but the strongest, and largely because the school too often still is a machine grinding for the ideal size rather than an organism continually adapting itself to individual variations of many kinds and degrees.

L's desire to stand is constant and she is unwilling to sit or lie down more than a few minutes at a time unless particularly engaged in some way: the delight that she derives from this action is obvious. She tries to go to her mother very often and

when the latter goes out of the room her sorrow is often emphatic.

237th DAY. She evidently now realizes the association between her big old doll and its name, for when one asks "Where's Betsy Ann?" she promptly looks around at the doll in whatever part of the room the latter may be. There has been no effort whatever made to form in her mind this association, which is the first certain association that has been noticed so far. In general, from a number of circumstances (such as facial expressions, attention, pointing, turning, etc.) it appears that she is beginning about now to connect names in her own mind with objects and persons, and perhaps it might be supposed beginning to consciously think, to deliberately turn things over in her consciousness. The signs of this as yet are somewhat uncertain, to be sure, but such as they are they have certainly appeared within a few days. She acts sometimes now as if simple things said to her were retained in her attention a few seconds for deliberate consideration, and certainly the last four days have shown new degrees of recognition and of general psychomotor association.

Physiologically, it is likely that the reason that these conditions were noted on this day lies in some "chance" perfection of bodily well-being occurring at that time. It is not at all implied that anything "mental" that was essentially new in kind occurred for the first time so suddenly as to be observable on any one day, however accurate the observations of new signs of such development. But this is, of course, of continual occurrence in any study of an animal's evolution day by day.

The common problem is here suggested of how far a general impression received by a not actually incompetent observer may be admitted into child-study. In medical, especially neurological, diagnosis, general impressions in experienced minds are commonly admitted to have considerable weight, and in child-study the conditions are not wholly dissimilar. The most usual form of disparagement of the value of all such observations coming commonly from some experimenting psychologist rests on the real danger of prejudice arising in a priori theories. A much less valid objection to the scientific worth of such general impressions arises from the usual lack of the employment of instruments of precision so generally used in the laboratories. It is certain, however, that pure research of this sort sometimes misrepresents, because of its artificial singleness and false simplicity of study, the actual psychophysical condition. This condition, whatever it be, always has its real meaning in a totality or integration of many interdependent processes, whose unreal simplification is avoided by a reasonably well-guarded general impression. This same error has happened continually in physiology (and especially in the laboratory work in that subject) namely, of studying single muscles and nerves and organs artificially separated from their organic environment. The tendency now, on the other hand, is toward the investigation of functions as they actually are in the living organism—muscles as parts of a synergy or syncitium, nerves coördinated, &c.,

Thus, in the concrete psychophysiologic example in hand, many things combined to lead one to suppose that about Day 237 in this child deliberate and active associative thought was about "commencing." Such an impression, properly guarded and wholly inductive in origin, seems as valid and at least as "scientific" as the complexity of human psychomotor behavior ever allows.

End of 34th Week.

239th DAY. The retraction of the corners of L's mouth in laughing has been very marked lately, making her smile, etc., very broad and "open."

She jumps up on her feet now very readily when she wishes anything that is spatially distant. To-day she had her introduction to paper and pencils. She learned their respective uses after being shown a little and immediately tried to make marks, but succeeded only in making separate elongated dots, and spasmodically at that: mere jabs at the paper.

240th DAY. When one says to L. "Horse!" she now looks out of the windows at once and waits for a horse to come along. At 'Pig!" she looks at her rubber pig in a similar way; her nurse's term "tick-tick" already means clock to her. She also recognizes the names of other familiar possessions. When given a pencil and paper today she recognized them immediately, was delighted, and laughed, and then tried to make marks without having been shown since yesterday.

The singing of the sea-shell made her laugh to-day as it did a week ago.

242nd DAY. L. is eight months old today. Accustomed to let things drop to the floor (to hear the sound?) she was obviously and clearly much surprised today on doing so with her ball to see it sustained over the edge of her carriage (by my hand).

243rd DAY. She has today added to her list of the names of objects cart as the name for her pearl-and-gilt bird-carriage, for she picked it out of her basket of toys on request every time early in the day. At 7:30 p. m., however, she either would not or could not. She now gives signs of understanding to a considerable extent things said to her.

Today she has learned to deliberately shake her

hand when asked to do so. She babbles little of late compared with its frequency a few weeks ago. End of 35th Week.

246th DAY. L. has now learned the meaning of "flower." She readily shakes her hand gently when asked to do so. She still blinks occasionally, but much less often than formerly. Her hand-flexion habit has not been apparently practised much of late. She now lets no one but her mother "cuddle" her, and even her not much; she prefers generally to sit up capriciously straight or in all her dignity even to stand. When one says Horse! she looks out of a window wherever the room:—the association between "horse" and "window" is so perfect. Someone made her a tall gay dunce-cap which fitted her head closely and had bells on its apex; after trying unsuccessfully to reach and remove it with her hands once or twice, she actively nodded and shook her head to tip it off. This adaptation is an unforseen faculty, and so far as could be learned was not imitative. Her spontaneous vocals lately are mostly bā bā, bï bï, bu bu, moo, Māmā; āei seems to indicate impatience and unpleasant excitement.

247th DAY. L. spontaneously pulled up her skirts so that she could see her feet, and did it promptly and actively as if she had an image of her feet in her mind.

248th DAY. Today I heard her first (?) distinct consonant in a sound much like Tarp!

Preyer noticed the first consonant used by his boy on the forty-third day. L's early "speech" seems to have been wholly in vowels. This latter condition would doubtless be found to be partly dependent on the mother-tongue of the

child during the first year, the English sibilants being excluded by lack of capability to produce them.

When I tried to put my eyeglasses on L's nose, she anticipated my intention and turned her head away. She recognized her little red rubber pig across the room when it was turned quite tail towards her and "asked" for it. She does not object at all to the bitter taste of a weak solution of the wine of ipecac (1:30).

She was greatly delighted while watching three little girls seated playing on the lawn in the Park, and laughed each time she looked at them. When one says to her, Where are your feet? today she immediately grabs her dress with both hands and thus quickly uncovers her feet, then taking hold of them with great glee; even when standing she tries eagerly to do this.

249th DAY. When I asked L. today,—"Where are your feet?" she at first gave no reaction, but on her feet being touched through her skirts she started on her usual charming little act of the revelation of her feet for the admiration of herself as well as of others. She "picked this up" herself and so the association between the word feet and the feet themselves may be imperfect as yet. It was said by her maid that she "wanted to do it this morning all the time." When one says All gone! she regularly looks toward a door.

250th DAY. L. saw some dogs today in the Park and was greatly interested in them. She listened with glee to a hurdy-gurdy before the window. She showed no signs of any objection to the taste of sodium bromide, very unpleasant to most adults.

251st DAY. For the first time L. saw a dog close by, but it was only for a minute or two; during that time she was all strained attention to him. She now knows the meaning of "where is?" for when one says this she waits expectantly to hear what object one will name. Her former kissing-habit seems now to be forgotten.

End of 36th Week.

256th DAY. When she wishes someone to come to her or to give her something, L. extends her right hand and flexes and extends the fingers rapidly. She readily shakes her hand imitatively and also deliberately when asked to do so, sometimes. She uncovers her feet it seems solely for her own satisfaction, for she objected much to having her feet covered even with a pair of bright red kid shoes. She has a habit of turning her head on one side "like a robin," as her visiting Grandmother says. I heard no vocal other than mā mā mā today, but she was not very voluble.

258th DAY. She regularly waves her right (or left) hand and fingers a little when one says Good bye! to her, and she also then looks toward the door.

259th DAY. L. recognized her nursery-maid across the street and waved her hand when she came a little nearer. She seemed partly to associate the entrance-door with her coming, but this was not very obvious. She actively smelled of a bunch of lilacs held to her nose; this she had been shown how to do sometime before. She watched the antics of some playful dogs on view out the window with great glee, as was evidenced by her chuckles, a very common form of laughter with her at present. She has

learned to think of her toes as "pigs" (according to the "little pig" nursery rhyme), for when Amy asked her casually where her "little pigs" were she immediately hastened to uncover her feet. It seems that associations between objects and their names are made with surprising ease sometimes and subconsciously.

End of 37th Week.

260th DAY. She recognized an orange as good to eat immediately, although she had seen none for at least three weeks; she put it to her mouth and vigorously pretended to chew it.

262nd DAY. L. shakes her hand now deliberately at her image in the mirror. She seems more interested today in watching little girls out in the Park than in any other objects. She reached out after some objects hanging out at a window across the alley in the rear of the house.

This may reasonably be taken as another instance of the doubtfulness of space-perception in the child of this age. Contradiction seems to be a prominent aspect of these reaching reactions and spatial observations.

She laughed boisterously at the loud explosion of her rubber toy balloon.

A few months later this rather frequent catastrophe always made her cry. It is obvious, then, that her ideas of possession and of value are not as yet developed.

The words papa and mama as words seem to be now taking on some meaning for her. For the first time she deliberately tore a picture given her and not apparently for the noise. Perhaps this is a first sign of the "natural destructiveness of childhood" that we hear about sometimes.

Inasmuch, however, as a tendency to pure destructiveness has never been observed in any degree in L., so far as evidence from her is concerned there is no evidence whatever for any such "innate tendency." In general we may doubtless well consign it to the limbo of other Calvinistic evidences of original sin now, save historically, forgotten. Both this and a supposed instinct of cruelty are certainly the ill-considered results of the useful development of a natural curiosity into the nature and mode of action of things.

263rd DAY. L's sensitivity to ridicule, as for months past, is extreme, and under certain familiar circumstances (as of ridicule or of patronage) at the least suggestion of a smile on the face of another she squares her lip quickly toward a cry. Her innate perception and emotional understanding of a mere suggestion of a smile is certainly very instructive to a student of the emotions.

When she whines for one object and another is handed her, she often throws it on the floor with violence. She cried for a glass of water resting on the table and seemed very thirsty—a new association. This seems to be a period fertile for her in associations—they show signs of their development unexpectedly often of late. She was much delighted at the elm trees near the windows when they waved their horizontal, willowy branches at her; it made her laugh with glee. She delights in paddling even in a glass of water after drinking.

265th DAY. Conscious imitations are common in L. now; she seemed to try to imitate the sound "Amy," her maid, but did not come very near to it.

266th DAY. The last few days she has become mildly afraid of a person's shod foot. Sitting on her mother's lap, she looked over to see her feet,

but when they were raised for her she started back alarmed. This must be due to her association of her feet with those of adults, for only recently she took great delight in seeing her own feet: (Day 248.)

End of 38th Week.

270th DAY. When she itimates the word papa it is nearly as apt to be mama as papa. She shook her hand at Amy without her usual cue of "good-bye!" when the latter went out through the door. Last night she slept from 9:30 to 4:30 solidly.

271st DAY. About the only vocals heard to-day were mama, ba ba, mapa—these constitute the great majority (for the most part directly imitative) of her vocal sounds. She has now a new habit of biting her mother's ear, and also of knocking off one's eye-glasses in a very deliberately mischievous manner.

273rd DAY. She almost says "Papa" spontaneously to me now. Her understanding of emotional expressions, facial and vocal, is striking of late. E.g., if one says in a pitying tone of voice, but not else, Poor little rabbit! she cries, etc. It is certainly curious how this understanding is obtained; one can scarcely avoid thinking of it as in large part hereditary and congenital "in the cortex."

This appreciation is essentially a basal and so hereditary physiologic faculty—of very different nature from a "tendency to destructiveness," for example. It may be, none the less, a knowledge derived from personal experience, but if so, subconsciously in ways practically impossible of definition. The same remarks, and more emphatically, apply to the awareness of the meaning of a smile noted on Day 263.

Here again (see Day 214) we have instructive illustration of the vast complexity of the sensori-motor mechanism,

neural and muscular, including both the cerebro-spinal and the sympathetic "systems," which manifests itself so early in every child. One sees this unlearned appreciation of all kinds of emotional stimuli (such as facial postures, gestures, attitudes, tones of the voice) not only in civilized infants, but highly developed in all savages, even the most primal (see Darwin's "Voyage of the 'Beagle'" and the admirable Capt. Cook's "Voyages"), and certainly in monkeys, many dogs and perhaps in pet birds and some horses, etc. Its presence in infants only a few months old is often a striking observation and is further evidence that the affective aspects of the mechanism of efficiency, including the "mind," is much more relatively complete than other phases and than superficial observation tends to reveal. The mechanism of practical efficiency in a potential form constitutes the very basis of the child's organic heritage, and it is most complete in its affective phases.

End of 39th Week.

277th DAY. L. is very talkative today and in a somewhat new way, actively and deliberately imitating every word offered her as best she can, and in a quite new degree. L. seems as if she were today making the beginning, the merest start, toward deliberate and conscious speech. Asked (for the first time) to give me something she had in her hand, she complied after a minute or somewhat less of hesitation, this appearing like a probable hesitation of reluctance.

279th DAY. L. does not object to the bitter taste of the placebo euphrasia, and in fact seems to like it. She seemed to recognize her Grandmother, whom she has not seen for some weeks.

280th DAY. Imitation is very prominent now, but the adaptation to unusual conditions is not perfect when she imitates. E.g., she tried imitatively

to put a coin into her toy bank, but did not turn her hand over so as to succeed. She was much interested in trying to catch a fly on the window pane.

End of 40th Week.

281st DAY. She tried to imitate the word "grandma," but succeeded only with the latter syllable.

284th DAY. Imagination is developed in L. now so that she repeatedly looked toward the door early this morning when hungry and made her jesture of desire (the extending and alternate opening and closing of her hand): obviously she visualized her Mother, who usually comes to feed her about that time. The imitation of sounds is very active; she tries to repeat all sorts of words, for example, but only rarely (save in case of papa, mama, etc., which are well done) does she succeed in getting the sound right; her effort to do so, however, is obvious. She knows the meanings of many verbs now, such as look! say! listen! smell! and immediately obeys them. In using her hands the thumb and index finger are used much more than the other fingers. In imitating directly from the action the dropping of a cent into her bank, she is still quite content to drop it on the bank, not catching the idea of the slot at all. Her habit of hair-pulling has quite gone now and some weeks since. A habit of attending to very small objects such as hairs, bits of thread, etc., has developed lately. She now calls me papa spontaneously without any doubt.

287th DAY. She has learned the names of the eyes and the mouth, but still confuses the ear with the eye.

End of 41st Week.

296th DAY. Absent from L. eight days, on returning I notice at once evident development both mentally and physically. She obviously recognized me. She makes more expressive vocals, uses a larger variety and speaks these somewhat more deliberately. When one says Listen to it! she holds the object to her ear, and when Smell of it! to her nose, sometimes smelling actively at the same time.

Having had no recent practice, her walking-reflex is no better than months ago. She did not in three trials succeed in picking up from her naked foot a coat that was placed on it, but dropped it out of her fingers each time. She pulls her own hair a good deal, but no longer that of others. She kisses pictures, etc., in a graceful way, when asked. She is distinctly inclined to use the right hand more than the left now, and it is not obvious why. (See under Day 68.) A good whiff of "Jockey Club" perfumery made her laugh out loud.

One could not, perhaps, have a better example of the laugh as part of the motor reaction of delight from a simple pleasurable stimulus than this. "Physical" pleasure (unlike satisfaction) does not often make an adult laugh aloud, but only because he has learned to inhibit such gross "expressions" of feeling. Physiologically it is the characteristic reaction of joyful states of consciousness, and the more naive the individual man or woman is the more often is the laugh as a reaction to bodily pleasure observed in his behavior. More conspicuously is it to be seen perhaps in adolescents at those times when they abandon conventional restraints.

A slight forehead-bump on the carpet made L. cry a few seconds, as did to a less extent the gentle biting of her toe.

See the preceding note which, mutatis mutanda, applies

equally well here. One stimulus was as well a sensation of pleasure as the other of pain.

297th DAY. Voluntary control over the extensor fibers of her tongue is evidently not yet acquired, for I could not get her to put her tongue out, although she now usually imitates eagerly every act shown her. She succeeded partly in imitating a gutteral consonant-sound to-day for the first time. Mild anger is now shown often by her throwing herself quickly backward.

Anger is usually a pleasant emotion. It was universally so considered by the ancients and the influence of dogmatic Christianity is to be seen in its frequent classification in recent centuries as an unpleasant experience. Major notes "stiffening the back" as a sign of anger in R. in the tenth month, and a reaction more like this of L's in the fourteenth month. The whole action may reasonably be considered perhaps the most available outcome of a strongly sthenic or dynamogenic "stimulation" of the central nervous system.

The soles of L's feet are as yet only slightly ticklish. No understanding on her part that some of the objects she handles are good to eat is as yet apparent, for she seldom puts things in her mouth.

298th DAY, Independence Day. The loud music of a hurdy-gurdy made her actively dance—more with arms than with legs, however. She was not frightened by the guns and loud explosions when she was out in her carriage. L. offers her right hand now to take objects much oftener than her left.

299th DAY. The fear of darkness and of the noises therein seems to be developing strength, for in the night she now often reflexly turns over quickly to whomever is sleeping with her when noises occur quite as if afraid of them.

301st DAY. It is surprising to see how much of what is said to her a baby of ten months understands. Associations are formed much more readily than one might expect, and in subtle ways that one cannot clearly appreciate or understand. The memory in infancy must be much more retentive than the adult can realize. She enjoys rolling about on the bed and at this time she is very active. Her long skirts prevent much creeping as yet. She found a new amusement today in repeatedly picking up small objects and placing them in a box and then emptying them out again—this she did several times in succession. I could not as yet induce her to protrude her tongue, imitatively or otherwise.

End of 43rd Week.

302nd DAY. L. is now no longer afraid of piano-music, but she herself "played" on the instrument with great delight and continual surprise. She obviously enjoys the higher registers most. She had her short clothes on for the first time today and when asked to clap together her feet at first she did not comply, but after a while she waved both of them antero-posteriorly, but could not be induced to move them laterally. This is doubtless because the abductors and adductors of the thighs are used seldom and so come late under voluntary control.

303rd DAY. L. tried to imitate the outblowing of a candle, but "succeeded only in blowing her nose," not getting the necessary mode of holding her mouth open and her soft palate shut.

308th DAY. Her power of imitation of vocals has developed appreciably in the last few days, for she now makes sounds in imitation of a whole phrase, several "words" together.

I have not been able to induce L. as yet to extrude her tongue, although she well knows where it is, what I mean, etc. She now uses the left hand and leg less readily for all purposes than those of the right side. In picking up coins from her dress, e.g., she still fails often to take hold of the coin alone.

End of 44th Week.

312th DAY. L. was not frightened by heavy thunder. She now has gained enough voluntary control of her lingual muscles at last to partly extrude her tongue on request. In closing a hinged box she knows no more than to leave her thumb in the hinge, showing a lack of constructive imagination! During the near playing of a hurdy-gurdy she now has a tendency to beat real time, more or less, with her arms and legs. She "dances" on request without the music when held up.

Preyer records that his boy danced all over from music in the second month.

314th DAY. L. started on a steamship-trip. She was somewhat excited by the novelty of her surroundings, but apparently was never frightened.

315th DAY. She seemed to enjoy the long ride on the train. For the first time in her life she today had hold of a little girl about her own age, and it was surprising to see how delightedly she hugged her and how emphatic were the signs of instinctive "natural" affection for even an entirely strange little girl; she certainly filled a long-felt want.

End of 45th Week.

316th DAY. L. watched some kingbirds that wished to attack her for going near their nest, and tried to reach them, although far up in the air.

318th DAY. She was strongly delighted at her first near view of some pigs and wished to jump right in among them. The calves, too, made her crow with joy, but she was a little afraid at the sight of a horse. The touch of a kitten's fur on her hand was obviously disagreeable to her, but their movements excited her delighted interest not a little.

This instinctive disagreeableness of the touch of soft, fur-like objects, noted in L. repeatedly since Day 196, has no little mystery about it, but nothing apparently that demands the supposition of an "instinctive fear" of fur. L. never exhibited any proper fear of feathers or of furs, and Professor Major records the same of his two boys. This frequently reported "fear" seems to be a consequence of the loose use of psychologic terms. To many adults as well as children the soft touch of many furs gives a shuddering, unpleasant sensation, but never an emotion of fear. The sensation is probably allied to the more complicated sensation of tickling, and its affective reaction is of a corresponding type.

321st DAY. L. was a little afraid of the sight of the calves today, although she has not been so before. In putting covers on things she is not persistent enough to get them exactly in place. She deliberately smelled repeatedly of a wild rose.

322nd DAY. She makes no progress towards creeping, but on the other hand stands better daily; creeping seems to be out of her line of interest or endeavor. She cannot as yet protrude her tongue. She smacks the lips in part naturally from relish, but sometimes imitatively. When asked to imitate various words, she oftentimes places at least her lips in the proper position, but yet when the vocal comes it varies usually but little from "păh!" Her

vocals are now distinctly less various than they were months ago.

To an extent somewhat less noticeable this suggestive consideration is also true of movements other than those of speech. The explanation in all cases probably lies in the fact that formerly the vocalization-movements were reflex and perhaps even more or less congenitally impulsive. On this automatic basis the innate complicated centers employed very many of the speech-muscles and glands in many complex and different ways. Now, on the other hand, at the beginning of conscious speaking many reflex movements are inhibited, the sounds are more deliberately produced and only with considerable effort, their variety being thus lessened. She has as yet acquired neither the motor ideas nor the neuronal connections, perhaps, for making more than a few vocals—some few vowels, a labial consonant (p) and an explosive (t). Her most frequent vocal by far is now pah!

As in the development of all voluntary and "free" activities (even to the evolution of civilization and culture) the first step is the restraint of impulsive and reflex tendencies. Now that we no longer think of a sharply circumscribed "speech-center," but know that the whole cortex (like the whole body) is more or less concerned in the expression of intelligence and feeling, this relationship is neurologically still clearer. The complexifying cortex under the mechanic lead of imitation in part, gradually learns to replace the restrained reflex vocal movements and the gestures proper by those movements which, experience teaches, serve him better in the satisfaction of his wants, because these, as not those, are conventionally symbolic. Most parents are aware that the automatic nature of speech tends to recur, especially in girls, some years later in its purely voluntary form, endless outpourings, in the normal maiden, of the inherent vitality and its numberless relations to its surrounding conditions.

L. often varies this vocal pah! by substituting e for a and sometimes by broadening the a to ah. The effort required to voluntarily make a vocal is obviously often considerable, as is shown by her changeful expressions, the characteristic delay, etc.

Imitation, of course, helps this process immensely, but there is some deeper purely human impulse which, by conscious imitation, impels the progress of speech far beyond the brutal stage of language-ideation. For the first time last night L. cried herself into the fatigue of sleep (with her maid present) because her mother would not stay with her.

End of 46th Week.

323rd DAY. She capriciously objected to the lace on her dress and tried repeatedly to tear it off. Her sun-bonnet she tolerated only after two or three mild attempts to remove it. She took her first pleasure-drive and was offered the reins to hold, but cared little for them; she watched their use, however, and after a few minutes, perceiving their connection with the horse, she was eager to hold them and reached for them herself. This is a good illustration of a quickly acquired interest on a basis of utility lending impulsion to the performance of new voluntary movements.

327th DAY. L. was greatly delighted today by picking some wild-flowers for herself. She couldn't hold but one object at a time, however, and dropped one flower from her hand always when she picked another. Intelligence can be *actually observed or felt to develop every day,* although often in ways hard to specify except as a greater general facility in handling her body, especially the hands, and in an understanding of more and more of the complex

relations of things. She now deliberately attracts the attention of her intimates by shouting her only word ("pah!") at the low top of her voice. Every day she loves a frolic better. She shows anger still by throwing herself backwards, extension. She investigated my ears and eyes with her fingers. She pulls vigorously at her hair when somewhat excited. She appeared to enjoy the odor coming from spirits of camphor.

328th DAY. L. readily recognizes and remembers by face and by name the cabinet portraits of persons familiar to her, picking out every time the right ones from a considerable number. She expresses her liking for any object sometimes by patting, rather harshly, its photograph.

End of 47th Week.

336th DAY. On returning home after a week's absence she is seen to have obviously better control of her arms, etc., although no advance is noticeable in her speech. She now recognizes her intimates when at a distance.

End of 48th Week.

338th DAY. L. expresses a mild degree of anger by gently and rapidly "bouncing" up and down and a stronger degree of the emotion by throwing herself backwards. The walking-rhythm is noticeably better than a few months ago. She now stands almost by herself. I tried to induce her to unscrew the cover from a wooden mailing-box, but although shown many times, she showed not the slightest tendency to make the needful rotary movements of her hand and wrist. Conscious imtiation, voluntary, then, often fails in movements entirely new, more particularly in those that have no functional

basis in the reflex mechanism. She seemed to recognize the sea as water, for she pointed to it readily when asked where the water was. Her memory for photographic portraits is now such that she remembers her numerous uncles, etc., apart at least a week. In general terms flat representations of objects are now as well recognized as the actual objects. As regards speech, some little advancements are to be noted, although still about all that is heard from her is the explosive noted on Day 322 and now more nearly beh! or bah! than pah! (enunciated sometimes with great vigor), together with an occasional "song," in which a larger number of vocals are reflexly or accidentally poured forth and produced largely, as it seems, by the random and extraordinary movements and position of the tongue. She is beginning now to use the fingers of her hands other than the thumb and the index. Kisses (with which she is fairly free to her most familiars) are produced by approaching to someone her mouth and nose and then making a quick nasal inspiration, the mouth not being moved; this came from her recent acquirement of the act of smelling of all odorous objects—that is, of voluntary inspiration.

While she was in bed with someone this morning that person, having said good-bye to her, drew down under the bed-clothes. Despite the big hump under them, the person was entirely lost to L., for whom she was asked "Where's——?" she looked all around the room, behind the bed, etc., never imagining that —— might be still where she saw her disappear. Only after this was done several times did she become able to imagine the person hidden out of sight under the bed-clothing.

This was the more surprising to me because in other respects she has seemed to exhibit a reproductive imagination already fairly well developed. That it was playful pretence of not knowing where the hiding person really was, the absolute and serious naturalness of her actions makes practically out of the question.

341st DAY. L. tries to have her cloth kitten and her doll share her meals with her; this obviously is imitative play.

Unless one limit the term play to actions concerned with some sort of extra-individual relationship, the word loses all meaning. If we include reflex and impulsive movements, e.g., play begins four or five months before birth! The very slow and gradual increase in complexity without break makes it quite impossible to place any beginning to play other than this—the beginning of social relationships. Of course in the theory of play many other and earlier appearing factors enter, notably, for example, psychomotor impulsive activities, whose function it is to relieve several varieties of inaction—strains and ennuis.

At the present time in education the connotation of the term play is far too wide, so wide, in fact, as to render the word of very little use in technical discussions. Its meaning should be narrowed to activities with social relationships of some kind.

L. remembers the noted disappearance under the bed-clothes three days ago, and to-night insisted on seeing what was under a hummock of the bed-clothes when really there was nothing. In imitation-vocalizing she now approaches most of the vowels somehow or other, so that the words do oftentimes sound as they should. Consonants, however, do not usually appear at all. "Pap" (for papa) is

about the only word she uses intelligently. She understands words enunciated in the slightest whisper as well as if spoken aloud. She used her left hand today as much or more than the right. She smells of things indiscriminately and gives no sign of disliking any odor that she has so far experienced; she seemed, however, to like the odor of a fir-balsam pillow, if one may judge by the number of times she smelled of it. (See Day 296.) By mischance she put some pipe-tobacco into her mouth and chewed it without any sign of dislike. In fact, she strongly resisted the removal of the tobacco from her mouth.

Neither her father nor her immediate grandfathers ever chewed tobacco! L's sense of taste so far shows signs only of missing sweetness. It was not for forty-four days yet (Day 385) that she showed evidence unmistakable of the dislike of a taste—and that was castor oil! The refusal of peppermint-water (Day 58) may perhaps be accorded to the slightly irritating nature of the weak emulsion of the oil in warm water. No judgments of the human individual, infantile or adult, are of course more purely arbitrary than those as to the agreeableness or disagreeableness of tastes and smells, but the physical basis of the arbitrariness is still absolutely unsuspected. Some day perhaps the ions will help us to "account for tastes." (See Day 58.)

In the absence of actual distaste we may account for L's objection to the removal of the tobacco from her mouth by the fact, obvious now-a-days on every street-car, that jaw-exercise, like others, is positively pleasant.

Mrs. Moore's boy showed no strong dislike of a taste until the fifty-eighth week and then he objected to the bitterness of some medicine, for which no one will blame him.

L. cried today at a slight pinching she gave her thumb. (See Day 79.)

343rd DAY. The desires and intentions of a young child seems very precise and well defined to the child often even when they are of a highly complex nature. For example, today L. insisted that her Mother should over and over stick up a black feather in the crack of a gate-post as she had seen it once, a day or two before. On seeing her thirteen-months-old friend walk successfully, she immediately and with great energy tried to do it herself, but much less successfully. In trying to walk, one foot advances before the other finally all right, the rhythm-coördination being good; but a lack of coöperation is shown in her (voluntary) attempts to deliberately flex and extend the legs, for the foot is not meanwhile sufficiently flexed. She was very talkative (after taking some strong and stimulating fresh beef-juice) and articulated an unusually large variety of vocals. The use of her hands in relation to objects is no longer noticeably awkward. She is very obedient always thus far when she understands what is wished of her, and so both as regards the doing of actions and as concerns their inhibition.

End of 49th Week.

344th DAY. Standing in the hall on the floor above, directly over L., I called to her, but she had no idea whatever of the sound's direction until, laid down on a stair, she saw me. She took great and new delight today in the colors of the sunset-clouds. She remembered from yesterday the letter B on her blocks. She shows no dislike of the bad odor of rancid fish-oil belonging to some small and clean fish-vertebrae she has to play with; in fact, she often smells of them deliberately to repeat the experience.

She almost pulls herself to a chair by the arms today.

350th DAY. The walking-rhythm is very "perfect" now, although a little clonic movement or jig (of impatience?) comes in every few steps. No objection was shown to an odor of iodoform. She finds it unpleasant to sleep indoors save at night, but she sleeps easily out of doors. No progress of late is to be noted in speech; some days new vocals seem to appear, but for the most part they do not persist in any way.

End of 50th Week.

354th DAY. For the second time I today noticed in L. that fixed staring state ("brown study") as if she were entranced (really moments of mental and bodily rest) seen occasionally in adults. She tried repeatedly to pick up the pictured flowers painted in her book and acted as if very impatient that she could not do so. It is hard to see any reason for this action, unless she really for the moment mistook for some unexplained reason the two-plane object for one in three planes. This would tend to confuse one's judgment as to the "innateness of space-ideas" somewhat and to be perhaps an argument against it, as this sort of confusion is the rule with L. at present. See Day 361, etc., etc.

357th DAY. Her walking-rhythm improves daily and the steps are now regular in size. Her power of balancing has not yet been acquired, so that she cannot walk alone. There are no suggestions ever that it is natural for the toes to turn outward as some "anthropologists" used to claim. The propulsive leg-movements for creeping have not appreciably improved.

In this matter of toeing-out in walking, about which so much used to be heard, there is at hand an example of a fad, based on research scientific if mistaken, that has done no little harm to thousands of civilized men and women now beyond middle life. This acquired habit, combined certainly with too little walking and bodily over-weight, is undoubtedly the chief cause of the broken-down arches so very common at the present day. No one yet, I take it, ever saw a baby with normal feet that toed out much in learning to walk, and this argument is valid for the walk of the adult.

End of 51st Week.

358th DAY. L. has learned today to blow for a brief time her little tin trumpet and in this manner:—By imitation she had put it in her mouth and, she chancing to laugh, it sounded. This showed her for the first time that she could blow it, for she had always failed to do so in her frequent previous attempts. She soon succeeded, but more or less by chance, in blowing it again, some of the attempts being inspiratory and most of the expirations coming out through her nose instead of the mouth. After a few minutes and a number of attempts, she gradually gained voluntary control of her soft palate (and epiglottis?) and succeeded in sounding the trumpet oftener. This control was not made complete today, however, for there were frequent failures.

Voluntary control seems to be more easily acquired over inspiration than over expiration—at least L. learned it some months earlier, her kisses, for example, being at first short inspirations. It seems, furthermore, more natural to inspire through the nose and to expire through both the nose and mouth; but it is obviously easier to close the lips after an inspiration than to close off the posterior nares by shutting the soft palate and the epiglottis.

This is as one might a priori expect from the relative strength and number of the inspiratory and the expiratory muscles. The latter are almost wholly of secondary usage in the respiratory function.

L. has not yet learned, despite many lessons and earnest attempts, to unscrew the covers of boxes, etc.; she can not seem to grasp as yet to any extent either the general idea or the motor idea of the movement of rotation, and especially not those of turning the hand around and then relaxing it so as not to turn the rotated object back again. She cried spasmodically at a bump her forehead received when she fell over forwards on to the carpet. She now uses either hand equally well, e. g., in putting on the closely fitting cover of a small box. She has learned within a week that the easiest way to get an object out of a small box is to overturn the latter, but apparently she has not yet carried the generalization so as to have an expectation that every unsupported object will fall. Little change in her vocals lately is to be noted, although taking the day through she now uses a larger variety of sounds than formerly. Later in the day her power to blow her trumpet at will was not markedly better than at first: this is a complicated movement or correlation that is not so quickly acquired "for good." She does not or cannot say papa or mama "to order" or imitatively now as she could two or three months ago; these sounds are never heard at present, even made by imitation. Consonant-sounds are more numerous than formerly, and they always come as if it were by accident.

This frequent condition of mixed casualness and effort seen continually in a young child is one of the instructive facts

to the physiologist, for it proves how inherently and how gradually the voluntary grows out of the reflex.

361st DAY. Today, having a tin bell and a natural-size picture of a similar bell, L. could not be induced to try to shake the picture-bell but readily shook the real bell. This somewhat indicates that she does now at least recognize the picture as other than a tangible object in space. (See day 354.) It is likely that the picture is far too little realistic; and, again, her perception may well be neither one way nor the other constantly—sometimes she thinks a picture-object solid and sometimes only plane. For the first time, she today showed signs that an odor was disagreeable to her, namely, by turning her head away. The odor was that of a fresh marigold, one not especially unpleasant, perhaps however only because not strong. She instantly imitated the word curl by "twil" quite plainly, she could not, however, do it again voluntarily, but said her usual pah! instead, although she tried hard to say the word desired. Reflex imitation is, then, much more perfect than deliberate imitation even in speech. Having learned by experience long ago that many boxes were hard to open, causing one to make sounds, etc., of straining, she now asks one to open anything by this very straining-action, often accompanied by her usual asking-whine. She was a little afraid when she was set on the back of a horse, as indeed many older persons would be.

364th DAY. Drawing with both hands on a rubber band, apparently as hard as she could, she pulled slightly less than a kilogram.

End of 52nd Week.

365th DAY. (This is L's first birthday-anniversary.) She had her first taste of cake ("birthday-cake"), and unmistakably enjoyed it.

Having been asked to let a fly on her cup "have some supper," she immediately extended the notion in her mind and now insists that any of her toy-animals in sight and even pictures of animals should have food offered them whenever she is fed.

368th DAY. It seems almost certain that now L. deliberately uses the word papa to designate her father (i. e., with a true denotation attached) and likewise mama with especial reference apparently to her natural food. She has developed no power so far of reflexly imitating words, for no advance in this process has been noticeable in several months at least. She was distinctly jealous when another baby sat in her nurse's lap a moment. A few moments later, however, she offered him all her toys and voluntarily ran through all her little accomplishments (dancing, throwing-kisses, etc.) for his entertainment, besides hugging him violently on every occasion presenting. She now knows the names of all her features and points them out when named: her hands, fingers, feet, toes, etc. She is now beginning to understand the use of pronouns as substitutes for the proper names of persons.

371st DAY. L. today promptly "picked up" by imitation from another child 17 months old a habit of whining in little short grunts when wishing anything.

End of 53rd Week.

372nd DAY. She could not shake her head (as in negation), but understood so well what movement

was desired of her, that she tried to turn her head round by pulling the hair on one side of her forehead.

In this mediate way employed to rotate the head there is illustrated how far in advance of accomplishment an infant's conscious motor purposes may be; an, moreover, how clearly defined may be these intentions. Although this desired total movement of head-rotation must have been clear in her visual imagination, the motor "ideas" of the movement were probably very dim. Many small and interknit muscle bundles are employed in head-rotation, and it was not for fifty-five days yet (Day 427) that they were sufficiently coördinated by afferent and efferent out-branching neurones as to be under deliberate personal control in this particular required combination. None the less the actual rotation was consciously accomplished after a fashion, for the versatile imitative and voluntary aspects of the cortex of the hemispheres (?) employed instruments that had been coördinated for months, namely the arms.

This is only a higher phase of the familiar removal by the coördination in the spinal cord of a headless frog of a bit of acidulated paper, using progressively better adapted means to the required end. If one case is called reflex (unconscious) and the other voluntary they certainly are unified as both the products of adaptative mind fulfilling the inherent purposes of the individual. If we compare the conditions of the mental process preliminary to the action in the two cases of frog and infant, we speak of the former only in terms of afferent nerve-impulses (from the irritated skin to the spinal centers), but we describe the process in the child as a conscious image of the gross movement desired. I do not see how it can be doubted that if the strength and the persistence of the stimulus (acid) in one case urges the use of better and better means up to the limits of the frog's versatility of action, that it will do so likewise in the child and desires (largely in terms of afferent impulses)

force new functional combinations of muscle-bundles through the forced interknitting of motor neurones. These desires and other motives (e.g., the creative imagination studied by Ribot) surely were not continually in the child's attentive consciousness during these fifty-five days. They, therefore, meanwhile must have been present as physiologic traces—part of the subconsciousness (co-consciousness?) of the infant, incessantly coördinating and developing in many ways the individual's mechanism of efficiency.

In some respects this deliberate use of the hands to accomplish head-rotation found impossible after trial by the resident muscles is one of the most suggestive of L's recorded reactions. (See also the first note under Day 427.)

L. is accurate at learning common actions by imitation, such as that of Amy's "crying," sneezing, etc.

375th DAY. Her attempts to sing are now earnest. She offered "Johnnie B." all her favoriite toys.

End of 54th Week.

385th DAY. While it is plainly noticeable that she develops apace, it is not easy to define the details of this evolution. She creeps now when given a chance, having learned recently to propel herself forwards with her legs.

Preyer reports this action in the fifty-seventh week; Mrs. Moore, eleventh month.

She is very fond of looking at pictures. She has now learned well how to blow in and out, as for example in playing a harmonica. She is still a great cry-baby for her Mother. Today for the first time she objected to a taste—namely that of castor oil; heretofore she has taken even this without in any way reacting to it as disagreeable.

Preyer notes how frequently taste and smell are confused even by adults. The reason for this has recently been made clearer by the discovery of taste-buds in or near the olfactory (Schneiderian) area of mucosa in the upper parts of the nose. In his seventeenth month Preyer's boy confused these two senses, but discriminated them a month later. Data as to whether or not L. ever confused them are lacking. There were no signs of a perception of the odor of castor oil, slight at strongest, in this case.

L. throws kisses with much perfection and grace, and sometimes even a suggested memory image is "honored" in this way. She laughed at the absurdity of the suggestion that she should catch the smoke of a steamship a long way off just as she does my tobacco-smoke. So far she has not been induced by request to shake her head.

391st DAY. Several sorts of fear, for example that of falling or that of large animals, seem to be now developing rapidly, for she was greatly frightened today when set on a horse. The last time this was done she showed only a little fear, and the time before that almost no signs of any.

392nd DAY. Sitting at the table and repeatedly letting fall her plate and spoon, L. closes her eyes as if to deaden the sound of the fall. She then understands now that objects fall and anticipates the sound she expects them to make. Having hold of her carriage, she today walked about thirty-five feet.

End of 56th Week.

401st DAY. Away from L. for two weeks, development during that time is most noticeable in her speech, the number and variety of vocals being obviously increased. Her only voluntary vocal is still bă bă, and shenow answers this whenever asked

to repeat a word. It seems as if this were a particular habit and that probably she could deliberately make other sounds did not this habit control her speech-action and prevent. She did not remember the personal appearance of her Grandmother, not seen for nearly three months, although her name and portrait have been very familiar to her all this while. The conscious imitative faculty is now very active and more vigorous for vocals than for anything else, indeed much stronger for all vocal sounds than for other equally complex acts, although she has many "tricks" of common complicated actions that have been so learned. In trying again to put a coin in her bank, she could not yet freely turn her hand so as to make the slot and the coin coincide. Sitting on the floor, she deliberately tried to turn round, and fell over forwards. She knows how to creep well now, but seldom does so. She laughs at the mere prospect of being nursed—still her greatest delight.

This is another suggestive illustration of how readily even the anticipatory mental image of an organic pleasure occasions its biologically normal "expression," the laugh. Indeed it is likely that the actual pleasure is less apt to produce the reaction than its anticipation, perhaps because it absorbs the attention away from the emotional experience proper.

Not having been allowed to drink much from a cup for a few weeks (being fed with a spoon), L. partly has forgotten how to drink gracefully. Her delight in, and understanding of, pictures has noticeably developed of late. She has now learned how to deliberately shout when she is especially gleeful. She was much interested in a Negro servant's black face.

406th DAY. L. has shown in the last few weeks unmistakable signs of the development in her mind of an appreciation and fear of the uncanny, at least as regards the human form; for example, she would not touch at all the arm torn off from her favorite doll nor a little porcelain doll three inches long that had lost its head. This horror must be innate, for all her known instruction has been in quite the opposite direction. Nothing of this sort has been noticed regarding animal forms, but it is now unmistakable as regards the human body.

The three real fears that apparently cannot be explained in L's case, and which therefore are of necessity relegated into that convenient omnibus of "hereditary relics of man's early time," are here fears of the dark, of falling, and of the uncanny. They certainly possessed in L's case all the characters of atavisms, for no one is in any way or degree explainable as the result of personal experience, imitation, instruction or immediate heredity. (See notes under Day 97.)

Repetition is now a prominent feature of L's behavior—she points to things (to have them named) over and over alternately and indefinitely. She balances herself very well when bouncing about (mostly sitting) on the floor, but not as yet well when standing. She can rotate her hand now with no little expertness whenever she knows enough to understand the need of doing so. A plainly expressed negation to her is now usually the occasion of tears.

These tears were perhaps due to a nervous shock to the complacency of her stream of biologic egotism; they certainly were not due to fear.

End of 58th Week.

407th DAY. Apparently L. remembered the portraits of two of her uncles apart, although they have

not been seen before for two months or more. She showed, however, no signs of remembering her actual Uncle Charles, not seen before for three months. Bashfulness is now more prominent every day. She often tries to take hold of the nose of a pictured "person," as in "giving a Scotch kiss;" it apparently is simply that the sense of the incongruity seems absent, for she gives no signs, of course, that she ever mistakes a picture for a person. The present variety of her vocals is considerable. When not trying, she often reflexly imitates heard words very well. Whenever she feels neglected or abused she murmurs over and over "beby, beby," with apparent reference to herself. When carried feet down over the floor rapidly her feet vibrate fast as if she were running; when slowly they vibrate as in walking. This is not easy to account for.

It suggests, however, the elaborateness of the psychomotor complex of walking and running, for it implies a felt correlation between the amount of space passed through and the requisite frequency of the movements required. There is distinctly an unxplained remainder in this bit of behavior. At any rate it proves the existence in the central nervous system of the motor idea of walking, so to say, before performance has actualized it in a useful way.

The toes always point straight ahead.

408th DAY. To-day L. has acquired the habit of extreme pouting—another of the numerous impulsive motor acquisitions.

409th DAY. She did not know enough in drawing a toy toward her by a string to use both hands alternately.

410th DAY. On request, she promptly put her toe in her mouth with the aid of her hands.

413th DAY. She tried persistently to lay her head on a toy pillow one inch by one-half inch in size belonging to a little doll-bed of hers, and on failing she put the pillow up against (almost in) her ear.

Many observers probably would class this action under the head of imitative play, and be satisfied perhaps with such an answer to the natural general question, Why did she do it? What conscious motive in her mind started such an absurd action? In an adult, "caprice" and play aside, it would be irrational, a symptom of a disordered mind. Both of the acts prove in the first place a clear process of conception, namely, of pillowness—its denotation and its use. Perhaps we may say that we have here an example of ideomotor action without its more usual basis of habituality: the concept pillowness being clearly in mind sets going the actions that actualize it, namely, using it. In the older child the acts would have been inhibited by an absurdly obvious discrepancy, that, namely, in size. The lack of inhibition in this case may be deemed the basis of the play-element that was undoubtedly in the behavior. As the realization of the discrepancies in such play-cases develops, the inhibition of the play-tendencies becomes more and more prominent, until finally childhood's play-impulses are abandoned normally and usually for others on a more adult basis. It is a sorry individual indeed whose behavior contains no elements of play.

Preyer's boy held an earring to his ear "understandingly" in the sixteenth month—a wholly homologous action so far as conceptualization and desire for utilizing the concept are concerned, without the incongruity.

L. is very suggestible, doing readily every reasonable thing that one tells her to do. (She shows in these cases a reaction-time of two or sometimes three seconds.) The above noted extremely in-

congruous action was not suggested, however, in any way. Some idea of incongruity apparently is in her mind, but if it were present in this case it did not prevent the ideomotor reaction. She often laughs at the incongruous. She plays all day long in the best of humor.

End of 59th Week.

420th DAY. The past week L. has developed the habit of actively creeping about the floor, and also several new motor habits based on a recall of her own and others' acts. She indicated that she felt very sorry for a fountain-statue because the water fell so heavily on the figure's head. She remembers from being told once her left hand, etc., from her right, for she always says it rightly the first time, when asked. Vocals are not apparently different in any way day by day, unless, perhaps, clearly a little better controlled. One could not by asking induce her to shake her head, nor to make pencil-marks in any way like the letter A, the form of which she knows very well; her only movements were at the elbow and backward-and-forward in direction. In this action she seems to rather prefer to use her right arm, but the difference is not great. The past week she has for the first time almost delighted in making a real racket with boxes, etc. Laughter aloud seems to be now her constant expression of the emotional anticipation of pleasure. Anthropomorphism as regards dolls, pictures, animals, and even, sometimes, inanimate objects, is strongly noticeable at present; her dolls, etc., she thinks (or pretends to think?) wish to do all that she does. She now would rather look at pictures apparently than do almost anything else. She

throws kisses at the mere mention of the names of persons she liked in Nova Scotia last summer—suggesting the livliness of the reproductive imagination and its close connection with the emotional sensori-motor complex.

End of 60th Week.

424th DAY. For the first time today L. pulled herself up to a standing position of her own accord by help of a chair, and later on without the chair, and her balancing-power is now developing.

Preyer's boy stood alone, for a moment only, in the thirty-ninth week, and Major's R. on Day 316. Demme's observations led him to set the standing-alone period for average infants at between the forty-fifth and forty-eighth weeks.

L. is now eating more substantial iron-containing food than formerly and her strength shows the gain: eggs, beef-juice, soups, bread and milk—a diet rather too substantial perhaps for continued use.

427th DAY. After months of often-repeated requests on my part, this morning she succeeds in shaking (rotating) her head when asked to do so, and does it very vigorously. (She has for some time deliberately tried to rotate her head with her hands.)

She did not today do it at first deliberately, but (as in all observed cases) apparently, only after she had found herself, so to say, doing the act accidentally or automatically, in this case somewhat thus: The last two days and today she has actively rotated her head back and forth to avoid a spoonful of food when she had had enough, and her attention was called by me to her shaking head notwithstanding her supposed inability to shake it. Later this morning lo and behold! she does it

promptly and well on demand, deliberately, although yesterday attempts were only partly successful. The idea of negation is probably not as yet connected to any degree with the movement, for when asked to say No! she tries to speak it, as heretofore.

Preyer's hypothesis as to the food-refusal origin (at an early epoch) of head-shaking for negation seems altogether not a little improbable.

The above-noted origin of this voluntary movement is a striking illustration of the effect that advance in motor facility normally comes only when the "paths are opened" and so sooner or later made conscious by impulsive reflex or "automatic" movements. Similarly, she has now learned to usually extrude normally her tongue on demand, (when she does not, she pulls it out with her fingers). In other words, in this rather striking sudden acquirement of voluntary movement in a complex group of muscle-units (the neck-"muscles"), there is evidence that well-developed compound motor ideas may be present in an organism and remain useless until the individual is in some manner induced to "find" and employ them. The child thought that she could not shake her head, for on often-repeated trials she failed to do so. Her head shook for a purpose reflexly and on her attention being called to the fact, immediately she acquired voluntary deliberate control over this portion of her action-system. Here really was an auto-suggestion to her cerebral motor-mechanism, actual demonstration of the capability desired that served to adequately stimulate the voluntary (cortical?) control of this large group of small muscles, a kind of dynamogeny of a qualitative rather than the usual quantitative sort. The practical educational corollary from this observation is as trite as it is important: Encouragement through suggestion of whatever nature! Encourage the child to realize how much he can do with his organism

by exercising his individuality, his inherent will. Here is an instance in point. (See also Day 372.)

L. tries to show her teeth when asked to do so. She expresses sorrow by smacking her mouth when she hears a baby crying, etc. Her sign of hunger and of thirst is now for both a sucking-sound with her mouth.

On Day 84 her hunger-sign was the active reflex sucking of her fingers and on Day 284 the voluntary extension of her arm toward her expected mother, with alternate closure and opening of the hand. This present sign is obviously more exactly expressive (because more conventional!) than the second, but less literal than the first reflexly controlled. This present sign is that one most habitual to adults for this purpose, and suggests therefore a step in psychomotor evolution since the fortieth week, possibly on an imitative basis.

L. sleeps very soundly and performs many common antics when asleep. She still seems to like tiny dolls, an inch long or more, better than her larger ones. She never puts things in her mouth, except when eating. She has as yet no idea of the filling of space, for she tried to put one of her wooden blocks into a box already filled with a block; she also tries to put ridiculously large things into small spaces.

Here is a nut for those to crack who still believe in the innateness of a child's understanding and perception of spatiality and space. It would be rather hard to believe that any individual who had any sort of an idea of space worthy the meaning of idea would attempt to put three hundred cubic inches of solid wood into thirty cubic inches of box. But these notes are frequently evidence of the baffling nature of this problem, this and color-sense being the chief stumbling-blocks in child-study.

L's musical sense has developed noticeably in the last month and now gives her evident pleasure; this appetency of music is something new.

End of 61st Week.

429th DAY. To-day when L. was sitting on her mother's lap and a hurdy-gurdy came up, she immediately desired (as shown by her jumping-movement) to get down and when stood on the floor she began to dance vigorously of her own accord.

This intimate and well-nigh reflex relationship between music and dancing will bear still more physiological study than it has had. The changeful loud and rhythmic tones furnish the joyful stimulation (dynamogeny) and the resulting activity expresses itself rhythmically of necessity. See Day 432. With the present fortunate wide revival of dancing as a means to esthetic culture as well as to bodily exercise, this mechanical relationship between lively accentuated music and sthenic emotional states is a matter of increasing social as well as scientific interest. Let the good work go on, for herein merge health and beauty and happiness to an extent seldom approached in a slowly evolving world.

432nd DAY. This morning on being asked to say "Yes" she promptly nodded her head vigorously, this capability having developed entirely since I asked her to say yes the last time, for then she was unable to do it. She now makes the head-signs for yes and no, the latter spontaneously when she means to express negation. Her use of facial expressions in general is most interesting and she "talks" very well in this manner, thus expressing most of her wants. Very lately several facial expressions have developed for voluntary use as symbols. "Making believe" (fully conscious imitative play) is coming in now; for instance, she likes to make believe drink

out of an empty cup, and smacking her lips expressively both before and after the action. For weeks, when she has wished someone to reach her something, she has taken hold of one's hand and with a grunt of desire pushed it toward the object. No fear of the dark is now apparent, but she is distinctively livelier in the light.

434th DAY. When a hurdy-gurdy came near L. again immediately wished to stand down and then began to dance violently (as on Day 429), several times, but it was noticeable that she danced as energetically to "Nearer, My God, to Thee," as to a jig; in other words, the effect of any sort of music seems to be almost purely sthenic.

She has now a well-defined "will of her own," but is amenable to coaxing to a considerable degree. Today she uses the symbols of head-bowing and shaking of her own accord for yes and no respectively; the nodding, however, is far less perfect in direction and certainty than is the shaking. She strongly desired to show to a picture of one of her last summer's friends her much admired toy automobile. The intense bitter taste of the tincture of nux vomica produced in her the same bowing, convulsive sort of shudder that it is apt to produce in adults, but when diluted she seems not to object to it very strongly.

The development in her power of speech is apparent only in the larger number of sounds and words which she consciously imitates. At the deliberate imitation of vocals she does no better than formerly and "bă bă" is still her imitation of all vocals when tried deliberately. She now tries imitatively to join her Mother in singing. A single short, grunt-

like sound is used for agreement or assent much as it is by many adults, while denial or negation is often indicated by a double short grunty whine.

442nd DAY. L's vocals reflexly develop in number continually. While ăh, hā, do, do ptee, ptār, are common as imitations, bā bā or pā pā is still her deliberate effortful rendering for nearly all words. She has come nearer to "dog" than to any other word so far. The reflexly imitative vocals are still much better done than are the deliberate ones, as is the case with all other muscular movements. She is now able to adjust her hands and fingers accurately enough to put a penny into the slot of her bank—the last time she tried this (Day 401) she could not do it.

The adjustments required for this action involve a large number of muscles of great importance in general efficiency, and consequently this accomplishment marks in a way a certain degree of psychomotor cleverness. For a day more than twenty-three weeks her organism may be said to have been learning this action, for on Day 280 she imitatively tried it and unsuccessfully.

L. uses her right hand now much more than her left, having been at first left-handed. She jumped and shouted at gift of a new toy cat, thus naturally "expressing" the emotion of joy. She recognized tiny crumbs of bread on the floor at sight and put them into her mouth with astonishing quickness; she does this with nothing else. "Aer" is her commonest exclamation of assent and interest, as it is of many careless adults. Suggestion acts powerfully even to the flavoring of food, the mere movement of pretended adding of sugar to her porridge

making it eagerly taken, when without it it is not at all acceptable.

This acceptance and enjoyment of imaginary sugar in her food is perhaps another instance of the predominance of an idea over the actual sensation-content of the moment. Education might take much greater advantage than it takes of this control of the easily suggestible subconscious over the attentive consciousness. The principle of subconscious suggestion, of course, is well defined enough in the education-scheme, but in some respects it might be made in theory and in practice more explicit and better adapted to special ends, especially early in the educational plan. Even the supposedly automatic functions controlled by the sympathetic (notably the movements of the rectum and of the urinary bladder) may readily be brought under habitual voluntary control very early indeed, as many parents and nursery-maids are rapidly learning now-a-days. That physiologic sort of auto-suggestion that the brain makes to the spinal cord and to the sympathetic is of especial force in these early months of life, and has no assignable limit then, any more than in the adult.

How imaginary sugar alters for the better the flavor of her porridge, it is more difficult to explain in neurologic terms. Perhaps, after all, the porridge is well enough to a hungry baby without the sugar, and such being the case she is quite willing to waive the sugar as soon as her mere desire-ideas about it are seemingly satisfied. But on the other hand many competents have offered evidence that the actual sensation-content is in some cases distinctly altered by extrinsic suggestion or by intrinsic desires or volition. Undoubtedly, then, the oatmeal or what not actually tasted sweeter than before. Later years at any rate offered evidence that L's imagination was of considerable motive power.

The last week attacks of crying-anger have begun and occurred once or twice, mostly consequent upon weaning L. This is obviously an emotional devel-

opment from the habit of crying when not nursed as promptly as she wished to be.

446th DAY. Thanksgiving. L. seems today and yesterday to have begun to have some slight deliberate control over her speech, for she said "tick tock" fairly well several times, and "Grandma" spontaneously when the latter came into the room. Still when asked to repeat words she replies mostly by her old (careless) bā bā. The variety of imitative vocals is noticeably larger every week. Learning to walk progresses by a somewhat greater confidence in her power of balancing. (Not being left enough to herself, she has in general little experience of her own powers.) She sleeps now usually all night, but not at all easily in the day time. Spontaneous and riotous joy was conspicuous this morning. Not going to dinner as usual tonight with her Mother, she quickly turned and pointed to me and then to the door. Even the slightest suggestion of an injury of any sort now must instantly be kissed by someone—a mode of "suggestion-cure" she applies also to her dolls and other toys also. In her own case it is very efficacious, for a tiny burn on the mouth caused by her pulling a small desk-candle suddenly to her face and which left a scar for a week, did not occupy her attention over half a minute, although it would surely have pained and attracted the notice of an adult for several minutes. Fright seems to be the chief element in most infantile injuries, for pain thus early is partly undeveloped. She today takes the bitterest of medicine without objection; but see Day 434. Her sense of humor surprises one often, for humorous imitations of persons' remarks, and animals' noises es-

pecially, always cause her merriment and often loud laughter. She has quite forgotten the letters A, B and C, which some weeks ago she knew by sight quite well. I could not seem to make her understand this morning the identity of the bright-red sides to her blocks—for she did not appear to be able to direct her attention to the redness. Perhaps it is not apperceived, even if perceived. It is in regard to nursing (now only once a day) that her intensest eagerness is still displayed; to be refused makes her rudely angry, while when indulged she is wildly happy, for it is her darling joy. Her tongue has not been noticed on edge as frequently as formerly, although it is so at times when she is trying to talk. She cried when playfully told that her doll had "burned her face" in a dish of warm pop-corn. The blinking habit of the 211th Day, for example, is now quite gone and probably months ago. She cannot (will not?) deliberately say "ma ma" however hard urged; her common consonant is b, in "ba ba."

448th DAY. When asked to draw a picture of her Mother's face, etc., L. deliberately makes extended marks on the paper and adds, by request, the various "features" one at a time. No resemblance whatever is to be noticed between her model and her production. She holds the pencil, but none too securely, between the thumb and the other fingers. She draws with evident internal design and while thinking of a model, for when she is merely making marks the pencil-point has a simpler to-and-from movement. She seemed to-day to have forgotten what the term a "Scotch kiss" means, although this action was very familiar and with a

certain and immediate reaction not over a fortnight since. It is instructive to see how these habits and memories come and go. In this case a hint of "nose" set the whole psychomotor performance going, as was her habit.

End of 64th Week.

449th DAY. In attempting to roll a heavy solid glass ball over the floor L. learns with difficulty the propulsive part, throwing it merely on to the floor at first. Later on today, however (for the first time), she throws it in such a way that it does often go forward—this movement apparently having developed "subconsciously" within a day or two. Of late once or twice she has lain on the floor on her back and raised her legs vertically for some seconds—a new exercise for her.

452nd DAY. L. seems more and more afraid of loud noises such as that of a train passing near. She lay before her tiny doll on the floor two toys for the latter to play with. When held up before the mirror she already (and for some weeks) shows unmistakable signs of the personal preening of her features, so as to say, and makes various facial expressions, including those of self-satisfaction and of vanity—very distinct at less than fifteen months.

She stood alone several seconds yesterday, and for the first time seemed conscious of deliberate attempts to balance herself.

Occasionally now she has periods of a few seconds, even up to thirty perhaps, when obviously she is thinking or imagining actively and attentively. Little dolls (the size of one's finger or smaller) are still preferred to larger toys for some reason. Affectation is already apparent in her laugh—or

at least it is exactly like the affected laugh of some adults. The rising inflection on her exclamations means "no," the falling inflection "yes."

While she was playing on the floor the following vocals were heard in the course of about ten minutes (some others being omitted because made too fast, and still others because unrepresentable): A du du; ā!, eh, ugh, aha, oohooo; wă; hā hā ee; hey a chee; michy wup, ā bichy, ā wichy; fwey, aveh, vā vā. A hey bā bā ach hey hey hay hey; bo o o o. Hā a. Bowābābā, a va. Bithy, bithy, bithy. Ah ah, ba, ba ba a a a; bey ba ba, ba ba bábā; eh ugh. Eh a vèy, baba baba. Baaa Aaaa. Aha, hah hah haaaa. Ah! ah eh ugh Aaaaa ugh. Di! dong dida adida. Ahee. A du du avà abà fwey eh à wey, ah ah ah. Tithy, fwithy ah hà ha. Too too. Ugh, ugh. Ahey. Noo ee Dwa fwu fwu dee dee ahāā. Later on, from time to time, a-fzoo, a be dar. Ya ya (Yes!) Ah, ă. Tee tic (clock-tick) Aboo.

For useful analysis of stages in the speech-learning process see Major, loc. cit., p. 281.

She seemed not to recognize Amy—— her former nurse (from whom she separated sixteen days ago), although she saw her briefly a week or so since. Thus quickly do things in her crowded cortex come and go.

See, per contra, Day 171 and note.

454th DAY. L. is greatly interested all along lately in Negroes (servants, the laundress, etc.) and even her black dolls she seems to find more interesting than the others, with a touch of obvious humor being in her mind about them all.

Whence this tinge of humor? One finds no evidence that the black savages when they saw white men for the first

time found anything funny about the color of their skin; their attitude is rather either of fear or of veneration. It is possible that in this case the mental view-point was acquired from attendants, but this only extends this problem further back a generation.

L. shows advance toward walking by voluntarily standing alone; obviously her fear of a bump keeps her from trying it very often. She tried it, however, several times today when she found it was not too difficult.

Some of the vocals noticed today were: Doó ā Arff. Fvoo. Dere. Mnoo. Boo boo boo, doo doo doo, adoo, do. Lam, lam. Adey, dey déy dey. Afvoo. Ma ma ma daada da,—(excitedly and volubly, these that precede), Ptoo, ptoo, too. Every day now she tries some new and real word, succeeding well usually even now in the form and proper sound of the vocal. The word, however, is often deficient in impulsive force, especially the latter part of the word, E.g., in imitating "good morning" it sounds like a whispered "gnonnnn," as if in unconscious imitation of a Negro woman's "good morning," as perhaps it is. Her "dog" sounds more like dor, and "grandma" like grnmrr, all whispered gently. As far, however, as motor apparatus and the arrangement of the vocal organs are concerned she has already properly begun to talk, both by direct imitation and otherwise—that is, by organic voluntary elaboration of previously impressed auditory percepts. It is evident from her vocalization that already both her vocal cords and tongue-lip organs are under her deliberate control to some slight extent.

End of 65th Week.

455th DAY. L. pushed a chair around over the floor today. Anthropomorphism continues extreme: for example, she wishes all her picture-friends in her scrap-book to observe well and how nicely she can eat and makes a business of showing them. She "laughs" aloud very perfectly and loudly when asked to do so, the imitation being rather more perfect than the average adult could do it. Her "crying" to order is far less complete, consisting only in the covering of her eyes with the hand, a sound or two with her mouth, etc.

A few years later L. had become a adept at this particular and all too common emotional imitation, the "expression" failing only in the adequate action of the lachrymal glands—the socalled "dry tears." On many occasions, however, the stimulation extended also to the real secretion of tears—a true voluntary and adapted stimulation of the sympathetic. The habit lasted only about three years, disappearing spontaneously. Thus probably many and more useful chances of sympathetic control are neglected and lost in early "education." It should be one of the privileges of pedagogy in the first one or two grades to assist the child to an appreciation of both the versatility and the responsiveness of the bodily organism. Here lies one of the uses of a really efficient system of physical education.

Again this morning I could get from L. no certain indication that colors are discriminated. I showed her a bright red object or the red part of an object; then showed her other red objects, calling them each red; then asked her to "point out" red—and she quite failed to do so.

This failure was doubtless a failure to catch the idea of *abstracting* the redness rather than a a failure to discriminate the actual concrete colored surfaces. These tests illus-

trate what is perhaps one of the commonest mistakes made in the general endeavor to solve the color-question in infant psychology. L. probably had no sort of notion that she was being questioned about the color as color, and it is not difficult to imagine that the concept of color in general as a quality of objects may be entirely absent from a child's mind and then at some "moment," late or early, more or less by chance, develop into it with all its meaning. This very sort of thing happens occasionally with complexer concepts even in adults—one not infrequently "doesn't know what to look for," e.g. when he begins to study Ameba. Thus J. M. Baldwin's foolish but nevertheless over-advertised experiments on the color-sense seem to have little or no value, for they indicate chiefly that an infant prefers usually a bright object to a dull one, as indeed does the adult unless jaded by visual overstimulation or the victim of a false criterion of taste.

I have seen no recent indication that L. likes "colored" objects better than black-and-white or dull ones and by chance have had no suggestion either experimentally or by general observation lately that she apperceives colors. She sleeps nowadays from about seven p.m. to five or six a.m. and often at no other time during the twenty-four hours; she seems to be "one of those who need little sleep."

Later years showed no continuation of this fact of her sixty-sixth week, although she has always scorned the frequently restful and very valuable "cat-naps" that many adults make use of once or twice during the day. If only for five minutes, these short periods of sleep or even its first stage, lethargy, relax the skeletal muscles and cause that always beneficial vasomotor rearrangement of blood between the central nervous system, the skin, and the intestinal omentum in which their chief use consists.

During her meals L. is more interested in her environment than in her food and needs urging and

suggestion; with these encouragements she eats fairly "well."

458th DAY. I heard a true liquid vocal this morning deliberately made for the first time, imitating Hello! Her rendition sounds more like allah. The tongue was on edge to-day and cut up many antics. Having thus rather suddenly learned to make liquid sounds, she makes them often today. She cries when told she is a "naughty girl."

459th DAY. While actively kissing things to "cure" the injury from pretended blows L. tried for a moment to kiss the side of her own head, but soon discovered that something prevented her doing this, and she then immediately asked me to kiss the spot for her.

There's a delightfully naive kind of supposed metaphysical capability implied in this attempt of a child to kiss the side of her own forehead that is much more than merely amusing. It is an illustration, for one thing, how "free" the still unsophisticated human will feels itself. Spatial limitations are not yet felt, nor the "fleshy screen" so obvious always to souls like Browning's, for example. Psychologically, it is noteworthy, perhaps, that L. evidently visualized or at least localized the spot in question on her head without visualizing its spatial relations to her mouth.

I believe that the metaphysical problem here involved would bear further discussion.

Undoubtedly L. does appreciate redness in some way, for she acted very proud, even vain, of a new scarlet jacket; a white one it is certain would not have made her react thus. When grieved she still says bébee bébee bébee, and as if to herself. George, e. g, is pronounced much like "arge" with the g rather indistinct.

462nd DAY. L. proved not all afraid of a large "jumbo" bullfrog, but patted him readily. She made the categorical judgment "Dark" when taken to the window after twilight, pronouncing the word plainly. Asked to point to her red stocking when she had on one red one and one white, she pointed to the white one as often as so the red. So altogether the color-question is very much in doubt, for it is not easy to discriminate errors of denotation from errors in perception.

Conduct without relation to denotation of the colors (as three days ago and Day 225) gives evidence of early discrimination, but questions involving the use of color-*names* even much later than the present show confusion. The arbitrary connection of a symbol to its concept requires especially a degree of interest that is largely lacking here at present, abstract conceptualization not having as yet gone far enough to abstract color. Every teacher even of young adults knows how strong continually is the tendency to define concepts by citing percepts, abstractions by the concrete.

L. takes great delight in a sort of slight-of-hand trick that she has devised by herself, thus: she hides (by covering it up with her leg) a glass ball when it is rolled to her, then says invariably Gone! (very nasally), and then suddenly produces it with leg and hand, and acts as if much pleased by her little magic.

She has never yet seen any feats of legerdemain of any sort, and therefor this set of movements must be put down as a rather complex example of spontaneous play. It obviously implies the existence in her mind of appreciation of surprise as a factor in entertaining play.

More and more frequently now does one see in L's behavior short periods when she plainly appears

to be thinking how to do things, how to get control of her organism so as to do things that she wishes to do, either as the result of suggestion or by her own initiative. At times the expression of effort and that of inward attention to more or less untried methods is marked.

A series of brief articles on the physiology of attention in the "American Physical Education Review" starting in the autumn of 1910 might prove of interest in this connection.

To every request for an imitation L. responds at once; if she cannot manage to do what is asked of her, the effort satisfies itself in some already habitual act, as, for example, in a sound.

This vicarious kind of motor reply to a request for some action is a neuromuscular principle well known to be both theoretically and pedagogically important. It is, in short, that the energy made kinetic for or in a voluntary movement expends itself in some manner or other and usually in the musculature. If one movement is inhibited, another tends to be made and if even later in life all molar movements are inhibited, there is regularly an increase in the emotional tension. This means probably a widespread innervation of muscle, cross-striated and smooth as well, to the extent or in the manner to increase its tonus, or strain, without causing it to actively shorten. The effect of the inhibition, then, of a strongly innervated deliberate act is to throw the involved energy into the involuntary muscles and to increase (often immensely and criminally) the emotional tension. Unrestrained physical exercise in infancy and childhood is for this reason all the more indispensable. For example, in the first six grades or so of our public schools five minutes of marching (all the windows widely open) would be a benefit every forty minutes. The money saved on the needless ventilating plant could on this plan be used for an increase in the heating-apparatus! See "Education," September, 1910.

It is well recognized that the restraint of impulsive movement is injurious and that in every grade from the chiding of a restless normal child to the inability of the epileptic or the hysteric, often resulting in explosions of behavior that are most disastrous.

L. took a fold of her dress in her hand when asked to pat her bullfrog, so as to avoid touching the animal's clammy skin with her hand—certainly an instinctive feeling of dislike, for all her training has been contrawise. No fear of strangers is apparent now. The clear facial expressions that have been thus far observed in this subject are those of joy (smile or laugh); of pain (crying-expression); of outward concentrated attention; of inward concentrated attention; of vanity; of surprise; of contentment; of fear; of love; and of deception.

465th DAY. She walked a few steps alone, but her fear of falling causes her to hurry (with her mind chiefly on the support she's walking toward), rather than to go slowly, balancing step by step. If she balanced more carefully and more slowly she would have been walking before now.

End of 67th Week.

466th DAY. L. answered in her sleep last night exactly as she does when awake during the day when asked questions of a certain sort.

Her dreams noted on Day 214 were not obviously other than psychomotor, while the dreams implied by the vocalizations today are correspondingly more complex. In infancy the dreams relate probably to the occurrences of the preceding day to a larger extent than do those of adults. Frequent inquiry of L. as to her dreams for the past eight years have shown this to be the case. The answering of questions during ordinary sleep would seem to be still more

usual in children than in adults, as they are more suggestible. It would seem to imply certain normal mental processes that have to be called co-conscious or subconscious. In this child there has frequently been shown to be a rather close relationship between the dream-content and the bodily conditions, such as cold, for example,

L. burst out laughing at a photographic portrait of herself crying, and a similar effect is always produced in her by a picture of a tearful child.

Of all the stimulations to the feeling for the humorous this apparently is one of the most universal. The precise relations between joy and sorrow need and deserve physiological investigations. In some respects they are opposites, but in others quite as basal they are much alike. (See the notes of Days 115, 158 and 192.)

No development in motor speech has been noticed in a fortnight.

472nd DAY. Christmas. Judging by the use made of her little gifts, L. still likes tiny toys, such as a small tea-set, wee dolls, etc., better than larger ones.

She shows today improvement in the act of standing, but she is still afraid to try to walk alone. When looking at things, however, and so forgetting this fear, she stands up easily without any of the balancing gestures that are so prominent when she is deliberately trying to balance, walk, etc.

This means that already, before the actual balancing and walking-process as voluntary is complete, the motor centers are ready to adequately direct the process for her as in adult years. Here, however, they are still restrained by disturbing complexes of impulses from the "more purely psychical regions of the brain further up," as the popular present cerebral theory would have it. As usual, the chief disturb-

ing and inhibiting agency is a protective experience we call fear—often, as here, more harmful than protective, but of course on the whole useful. In this case the fear of falling down has had, so far as known, no adequate basis in such experience.

In literally "open-mouthed-astonishment" expression today did L. gaze at her Christmas tree, the first she ever saw. New and complexer vocals were heard today, but they were indiscernable.

She is now continually anxious to hear the names of things and about them; often she points to an object or a picture and then immediately to one's lips to suggest speech about it.

476th DAY. L. readilly imitates please by "pease," only rarely sounding the liquid; yet the liquid is one of the commonest of her spontaneous vocals, as also in her deliberate imitation of the gobbler's sounds. The rotation of the hand is still not performed readily. In attempting to draw a circle today the circular movement is much more nearly approached than it was the last time I observed her try it—the movement is now eliptical instead of angular and purely to-and-fro.

A considerable degree of conceptualization is shown by the ready and instant recognition of pictures of objects. For example, she says promptly "bow-wow" at sight of a picture half-an-inch or less long mixed in among other pictures, all badly drawn, on the cover of a German-printed box; the idea in her mind of a dog must be very definite indeed to agree so instantaneously with such a poor suggestion of one as is this small rude sketch. It is hard to say whence has been derived such a concrete notion.

The derivation of such concepts becomes easier to understand perhaps if we remember that interesting associations are more active and interactive and perceptive memory more tenacious in the young child than can readily be realized by the adult. No adult, for example, can adequately realize how any child, including himself, learned the marvel of speech. On analysis the complexity is beyond imagination, as is the neuronal association concerned.

I could not induce L. to put her finger on a red bead in among others, by asking her to do so under the name red. No idea of the word red appears to cling to her mind, although her opportunities to learn redness, in fact and in name, have been purposely numerous; indeed it seems doubtful if she as yet appreciates redness by name; there are certainly no proofs of it as yet.

The slightest opposition to her will meets with instant vigorous opposition in the form of a certain nasal sound often quite loud; but she can be readily coaxed.

End of 68th Week.

481st DAY. L. imitates a larger variety of vocals now than before; the ee sounds are heard of late much oftener than they were a few days ago and take the place in part of the bā bā so frequent in her babbling to herself.

Conscious thought appears to be more and more frequent and sometimes takes her attention six or eight second at a time. At times it concerns ideas new to her, and at other times she is clearly concerned with how to do new acts, especially vocalizations.

End of 69th Week.

484th DAY. She still expresses affirmation by a sound with a falling inflection, and negation with a rising inflection, (as on the 452nd day).

490th DAY. L's new expression of desire is Doo! in a very emphatic accent, but whether coming from I do or Do so it is hard to say. I could get no proof today either that she discriminates the word for redness and remembers it, for she did not point to red beads among others when she was asked to do. She retains and recalls, however, the names of other qualities and objects well enough.

Spontaneous play-instinct is actively developing now, as is seen in her showing her dolls, pictures, etc., to other dolls and pictures, e. g., this play being more conspicuous when people are not with her. She has excellent control of most of the muscles in and about her mouth, including the tongue, for many grimmaces are made, on demand, imitatively. Many vocals in fact are finally approached after some endeavor by sheer obvious effort of voluntary muscular control.

End of 70th Week

493rd DAY. Yesterday and today "Dooooo!" has been still more frequent and is sometimes used directly in the sense of yes. She said "Bac!" when she wished something given back to her, and Book! when she wished her scrap-book which was across the room. It still requires, however, a strong effort to say book deliberately and, moreover, the vocal is lacking in the consonantal explosiveness of the reflexly spontaneous vocal. For the first time, tonight without being questioned she talked aloud in her sleep, very much as when awake, suggesting again the present great activity of the speech proc-

ess. "Out!" was another new word today used spontaneously.

497th DAY. Memory for associated circumstances is noteworthy and L. often wishes them repeated days after in great detail; to humor her in this respect gives her great satisfaction and pleasure. Gentleness and tender-heartedness seem her most prominent emotional characteristics at present:—the notion of "little Tommy Green" putting pussie in the well makes her invariably cry. No advancement recently is to be noticed in her walking. She now says mamma and papa appropriately. Her best rendition of her own name (Lucia) so far is something like 'Ooose" with the sibilant indistinct. Only when excited now does she spontaneously bow her head for yes and shake it for no; usually grunts with the respective inflections are used for these purposes. Her pleasure when one comprehends her signs is obvious; sometimes she employs them for quite complex acts. She still regularly puts her finger on the mouth of a person from whom she wishes to hear names or other explanation; and she is very anxious to hear especially the names of things repeated over and over. Her efforts to say words imitatively on being urged to do so are sometimes evidently almost painful to her.

These actions and her whole related conduct (see Days 481, 491, 493 also) recently indicates a degree of vigorous eagerness to learn, perfectly spontaneous in origin, that should enthuse any observer in the delight and dignity of the teaching profession. Her developing language, with the ideas it implies, are of quite predominating interest to her just now—perhaps she is now just beginning to grasp the concept of

expression-by-language, to understand clearly the function of speech and the unique beauty and usefulness of words—criteria of humanity.

It is noteworthy how easily a child takes on and puts off the play-instinct and the emotions connected with it; for example, if I "hurt" a doll or even scold one L. cries and yet a second later she will leave the doll "in a heap" or in any other "unpleasant" circumstance and see nothing inconsistent in the two different modes of action.

End of 71st Week.

501st DAY. She says upstairs as if it were "uppy tairs-z." The th sound as in "both" is not noticed yet; final consonants usually are deficient; there is some tendency to make j sound like y. Usually the liquids are not sounded, but when they are, as in Hello! they are distinct enough, although accompanied by something of a nasal twang. So firmly fixed has become the habit of bowing the head (nodding) for yes, that I could not induce her to try to say yes by the word.

504th DAY. In picking out from a varied lot of ribbons colors for her little doll's dress L. chose a bright yellow, and then a white ribbon for a sash, in preference to bright blue or red or other intense colors; the intensity of these she selected is obviously at the maximum:—does it account for her choice of them?

The sound gr seems to be as yet impossible for her; she often tries, but never approaches it. Her rendition of Lucia has developed from Oose into Oosh,, sometimes with a slight second syllable.

End of 72nd Week.

508th DAY. Reproductive musical imagination is developed so that now she has the power to keep a certain song in mind. This was proved by her asking (by signs) for a certain song, and by her manifestations of joy when the right one was sung; no other song satisfied the demand in any degree.

Recognition of a highly abstract experience (a musical air) is, of course, implied in this as well as its recall in imagination—perhaps the most purely abstract process yet revealed in this infant.

Tonight the meaning of saying good-night seemed to strike her all at once and the idea gave her so much satisfaction that it made her laugh.

When L's attention is distracted from her fear of a fall she now walks alone nicely. For the first time she called another woman (save her grandmother) Mama—she now abstracts thus far. When asked her name she says Oóoshr! She lifts her feet over the threshold. She showed off all her accomplishments vigorously before a little boy (Kent—) whom she likes.

513th DAY. L. does not yet know what "two" means, at least by name. She asked me (by saying my name and pointing to the object or to my lips or to both, as usual) to tell her the names of some Roman letters on her toy cat, one after the other and over and over. It was quite as if she realized that letters in some way are related to meanings. This undoubtedly she does realize, for she herself makes believe read. She recognized very promptly pictures of cats and dogs and chickens upside down in her scrap-book, for she imitated their respective "modes of speech."

An object is recognized by adults more readily when inverted than in either of the two intermediate positions, and more readily than in the erect mirror-position or that position inverted. See "Psychological Review," Vol. VI, No. 4, July, 1899, where a research and brief discussion of this matter by the present writer may be found.

L's repetition of newly tried words is at present very noticeable.

522nd DAY. One cannot induce L. as yet to say two words together. She says, for example, Please! and Do! but does not know how (?) to say Please do! and she would not, even after being asked many times to do so.

Today she walks about the room by herself at will, having at last learned not to hurry. (Hurrying has been the cause of her falls and consequent fear so far.) She today for the first time also erected herself from the floor without any outside support; the feat pleased her so much that she did it five or six times in quick succession.

When her Grandmother told her she would "get cold standing near a window" she at once pointed to the (extra) sacque she had on.

Lucia she now pronounces Ooshár with a strong accent on the second syllable.

End of 75th Week.

535th DAY. For the first time she today joined words together in her speech, ("There 'tis!") but only imitatively, not spontaneously.

536th DAY. Again L. selected a piece of bright yellow silk out of many colors for a doll's dress. One cannot be sure that she knows blue from red by any reactions that she makes; she seems to fail to discriminate or else she forgets the differences

quickly. She spontaneously imitated the postures of the figures in small pictures, taking the various postures very nearly. She tried to push a pictured figure downward on the page. She uses the word tomorrow, but gives no signs that definitely indicate that she knows it means for her after a night's sleep.

There can be little doubt that, at least in a vague way, she knows herself as an agent with a name. Many acts and words and manners indicate this. She knows that she is called "Ooshár," that she can do things, that she likes things, that she is liked, that she is the possessor of dolls, etc. This is something very like self-consciousness, the recognition of her personality.

She walks and runs round the room freely today, over thresholds readily, and tries to go upstairs.

539th DAY. There seems to be something either instinctive or elaborately imitative, today at least, in L's regard for order and for neatness; everything must be put exactly in its place at once when she is done using it; she gets the brush to clean up crumbs, etc., often; puts waste paper, etc., in the waste-basket; and so on. No one has taught her this.

It is as if an instinctive tendency toward orderliness had suddenly appeared through the agency of a system of voluntary imitations. The instinctive basis of many such tendencies must, I think, be admitted, whether called play or not. How it happens that the imitations on one particular day, however, combine into such a system it is not easy to explain with any appreciable degree of satisfaction. Six months later (see Day 539) there were no signs of this habit-complex. To note the coming and going of the numer-

ous individual, social, instinctive emotional habits and fads is one of the most interesting and unexplained features of the continued observation of a child's behavior while it is still simple enough to be analyzed.

The most noteworthy matter at present perhaps is the degree of perfection of L's associative memory, of which numberless examples continually manifest themselves. An action-association, psychomotor complex, once impressed by the attention seems to be persistenly retained.

A piece of molasses candy, as long as it lasts, makes her joyful all over; her face is wreathed in smiles, her arms actively extended, etc.; at the very sight of it she shouts for delight. New words are learned every day now; some of these she pronounces very nearly as well as could an adult, e. g., waist.

There is visible no notion as yet of any difference in her mind between a general and a proper noun or term,—e. g., she says she is neither a boy nor a girl, but simply "Ooshār;" her black shoes are not called shoes by her but "bl'ck, bl'ck," metonymy from their color.

Of course this one last-noted fact is adequate evidence that the abstraction, conception of color as such, as a general quality of many things, is not yet clear in her mind, if indeed it be there at all. This frequent confusion between the conception (e.g. of color) and perceptual discrimination has obviously been costly to genetic psychology. We may need to admit that this kind of conceptualization at least does not become clear in a child's mind until the name of each color-concept is arbitrarily fixed in memory, and that may be late.

L. pretends with great seriousness to pick posies from the wall-paper to give away. She brought my

slippers and tried to return my shoes; soon after (the next day) she did it unasked.

End of 77th Week.

543rd DAY. She knows what "two" and "one" mean, but probably not what "three" means. She spontaneously counts for one, two, three: "tick tock tooo." This apparently is used instead of her trying to say one, two, three because she has said part of the tick, tock, tooo, already in imitation of the clock and because the tooo is identical to her with the two requested. Yellow is undoubtedly her favorite color. She uses the words red, blue, and black, each in duplicate: "bl'ck, bl'ck" for black. No doubt she discriminates these colors; sometimes her answers are wrong, but this may well be due in part at least to the difficulty of associating the names with the colors. It is not easy at first to remember, certainly, so arbitrary a relation. She assents very actively always when asked if yellow is yellow (using one of Milton Bradley's color sample-books)—as if the name were known, although she does not use it.

Neatness and orderliness (see Day 539) still seem an active habit—covers have to be put on boxes at once, clothes put away at once, things returned to their places, etc., although she has never been as yet taught this to any great extent. She says "There 'tis!" for recognition, constantly. No timidity of strange women or men is now apparent; she was, however, a little afraid of two little Negro girls who suddenly came into the room and went out quickly: she sidled away to the other side of the room.

546th DAY. L. now uses the word "anima" for animal—the first three-syllable word she has tried; it is very plain, save for the liquid. The names of

blue, red, and black are becoming fixed so that she now usually gets them right the first time. She saw the sun through the clouds and called it not unnaturally, the moon. She brushes off people's clothes unasked and reminds her mother that she has not her apron on, etc., yet she sometimes leaves her toys all about the floor.

End of 78th Week.

553rd DAY. L. now walks backwards oftentimes. She tried today to blow from the wall the reflection that she was trying to seize of a small mirror.

The memory of associated acts and conditions seems now exceedingly perfect, far more so indeed, from one point of view, than is that of an adult. This memory of associated actions seems to rule her conduct and acts to a large extent: she does little more than she has already done and meanwhile adds to or varies it, either spontaneously, or deliberately, or imitatively.

If one seriously should try to get down to the physical basis of this complicated fact of passive and active perception plus the fusion or association of these percepts plus their combination into conceptual complexes more or less spontaneously motor in effect, one would have practically to describe the physiology of the subconscious or co-conscious phases of the infant mind in an exceedingly plastic and fast-growing nervous system. The day has gone when the physiologist and many a psychologist hesitates to seek the immediate concomitants of such basal mental processes as e.g., learning by association and by imitation. One method is to invoke new complex electrical and chemical relationships at the recondite synapses—the chief objection to which is our ignorance of this convenient synapse-concept, for example, as to whether synapses exist or not. A less fashionable but perhaps more satisfactory way of representing physi-

logically the memory and development of associated actions in the infant, is to suppose that the actual new relationship between functionally related neurones occurs rather by neuronal growth. If one compare, for example, an average neurone as found in an early human embryo with a full-fledged Purkinje cell from the cerebellum of an adult, the actual extent and the marvellous possibilities of such evolution can scientifically be imagined. There is nowhere else, perhaps, in the body such a degree of intensive complexification in the course of a year or two or indeed in the course of a life-time, as in the neurones. The force that determines this interknitting of the neurones inheres in the nuclei of the cell-bodies probably. The pattern of the interknitting, however, we may suppose depends upon the relative perfection, degree and complexity of imitation plus an inborn impulse to deliberate effort that we need not here try further to analyze. The plasticity of the neural protoplasm is greater than that of any other protoplasm, and of course the development of structure in general by practice and effort is at present beyond dispute—here it certainly would be at its maximum. It is only by some such supposition as this, corroborated (or refuted) by careful technical study of the actual neurones as they develop, that we will finally arrive at the "physical basis" of mind, i. e., define in some detail the conditions of the identity of the two aspects of personality, called mental and bodily, respectively.

This note, then, in the observation above ("she does little more than she has already done and meanwhile adds to or varies it, either spontaneously or deliberately or imitatively") if explained in terms of the mechanism of efficiency, would include the whole histology and physiology of the central nervous system, but in so doing it would set us the basis of a mode of education, cultural, vocational, and manual, that would make it exact and individual where now too often it is more or less at random because almost wholly empirical instead of biologic. The present writer believes that exact histology and physiology and psychology have not yet en-

tered upon their proper work in relation to the science of education, their method even not being defined for this particular (and is it not the preëminent?) field. There is no reason for example why we should *not* know the bodily conditions which represent this gradual development in efficiency in functions already acquired. And when once these data have been learned we may be sure that it would be only a little task to work out the basis of individual differences and to adapt educational methods to every variety of child and to every kind of efficiency. To many educators the certain and revolutionizing development that is bound to come along these lines of exact science has not even come as a possibility, so much still is our educational system the empirical relic of the Platonic and pre-scientific epoch.

L. always uses the sounds "bow wow," "meow," and a sort of whining cry respectively for dog, cat, and baby, although she knows these real words perfectly and uses them when asked to do so.

The preference shown for onomatopeic names of animals over the common symbolic word obviously depends on the greater inherent interest of the former kind of words: they have in themselves some sort of meaning. Moreover being better associated, such names are more easily remembered. So far as the evolution of symbolic language phylogenetically is concerned, it seems reasonable to wonder why there are not more onomatopeic words in the various languages even than there are.

L. rarely now confuses the names of the four colors that she knows, and always picks out yellow as her favorite among these four: yellow, red, blue, and black.

Preyer reports that his boy learned to name the colors (unless very dark or very light) correctly during the thirty-seventh month, but then more than four of them. It should be borne in mind that not a few normal adults disagree

as to the names, not to say the quality of colors, and, as has been pointed out, the names and qualities together constitute one problem and not two.

L. knows the names of matches, eraser, etc., etc., although never told them. The brain retains useful impressions casually received; this largely is how children learn to speak. She said Please! spontaneously in a begging and proper way.

End of 79th Week.

560th DAY. Talking has developed rapidly in the last week; L. says "naw naw" for no and often shakes her head at the same time. She calls a dog both a "bowwow" and a "dor," most often and especially spontaneously, the former. She called red blue today, probably confusing the names. Asked what she would most like from the toy-shop she said a doll and next a "bowwow." Her doll "Dolly Ann" she calls Ann only, (realizing, perhaps, that "Dolly" is not a proper name?).

She uses a pencil with her left hand as well as with the right—and surely not very skillfully with either! She enjoys as much as anything looking in books for pictures.

End of 80th Week.

567th DAY. L. still sometimes confuses the names for red and blue. She deliberately sat down in the "lap" of a sketch of a baby that her Mother drew with chalk on the floor.

Sitting on her mother's lap, she extended, adducted and turned inward her feet quickly enough to catch a box that her hands had accidentally let fall.

This semi-reflex reaction proves that her muscular and nervous mechanism is already coördinated so as to be under the "will" and the needs of the personality; the reaction-time

blue, red, and black are becoming fixed so that she now usually gets them right the first time. She saw the sun through the clouds and called it not unnaturally, the moon. She brushes off people's clothes unasked and reminds her mother that she has not her apron on, etc., yet she sometimes leaves her toys all about the floor.

End of 78th Week.

553rd DAY. L. now walks backwards oftentimes. She tried today to blow from the wall the reflection that she was trying to seize of a small mirror.

The memory of associated acts and conditions seems now exceedingly perfect, far more so indeed, from one point of view, than is that of an adult. This memory of associated actions seems to rule her conduct and acts to a large extent: she does little more than she has already done and meanwhile adds to or varies it, either spontaneously, or deliberately, or imitatively.

If one seriously should try to get down to the physical basis of this complicated fact of passive and active perception plus the fusion or association of these percepts plus their combination into conceptual complexes more or less spontaneously motor in effect, one would have practically to describe the physiology of the subconscious or co-conscious phases of the infant mind in an exceedingly plastic and fast-growing nervous system. The day has gone when the physiologist and many a psychologist hesitates to seek the immediate concomitants of such basal mental processes as e.g., learning by association and by imitation. One method is to invoke new complex electrical and chemical relationships at the recondite synapses—the chief objection to which is our ignorance of this convenient synapse-concept, for example, as to whether synapses exist or not. A less fashionable but perhaps more satisfactory way of representing physi-

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thing she expresses by "Han'!": to hold it in her hand.

End of 86th Week.

607th DAY. She could not so roll the slender spindle of a small top between her fingers as to make the top spin. Several earnest imitative attempts were made to acquire this voluntary movement.

609th DAY. L's use of the names of colors is still confused, although her discrimination of the colors themselves seems to be complete: she answers before she thinks, and so uses the wrong words, sometimes. The most mischievous thing she does now is to empty little things on the floor—apparently to see them scatter and roll about. She now counts one, two, three, four, five, but not invariably, and often varies it capriciously as if for the fun of it. We do not know of any words that have been actually originated by her—her "amenoo" (open) is certainly a corruption of "open it" as I know from my observation of its beginning. Certain words have been imitated from people, of course, many of them indeed, but there have appeared in her vocabulary no onomatopeic words except the sounds of the wind, engines, water, etc., used as names for the objects making them. "Bow-wow," etc., were first used only as imitations.

637th DAY. L. has been a month away. She has grown tall appreciably and looks in better vigor from being out in Central Park so many days. She said yesterday in regards to the letter-scales "—— weighs by it," the first observed use of a preposition. Her vocabulary has greatly increased in the last month, and she now tries to say most everything she hears.

She showed great affection while away for a little baby-boy, and kisses his tiny picture now she is home. Now when she says "Oosar" she points to herself—a new index of self-consciousness since she went away. Wetness on her fingers is obviously disagreeable. Association with many children has changed her somewhat and especially in that she is now more or less obstreperous.

End of 91st Week.

644th DAY. L. now calls her Mother "Mummer-mummer" and for the last week or more; no one knows the origin of the strange name, but the habit is well defined. Could not induce her to speak the sibilant in "Sambo" (her black doll), but she called it "Ambo." She uses the pronoun me sometimes now, especially in "Gie me mor!"

End of 92nd Week.

651st DAY. The number two seems to be well comprehended by L., but yet she counts for two objects "One, two, free, for, five;" this would seem to indicate that the larger numbers are perhaps not understood. She sets the table for her dolls and puts the latter to sleep. She seeks the company of her cloth "baby doll" when lonely because of her Mother's absence for a few hours. She hugged over and over a bouquet of daisies, buttercups and clovers, and likes to play with them.

Speech develops rapidly, and pronunciation is sometimes very perfect; this is especially conspicuous on immediate imitation.

End of 93rd Week.

665th DAY. L. enjoyed her sea-trip down to Nova Scotia, and was not sea-sick, although very many were. She has been away from her own and her

nurse's room here nine months, but remembered it well, for she said "Amy——'s room!" when she first went into it again; then "Amy——'s bed!" When she left this place she was thirteen months old, and slept in it then for eleven weeks. At Kingsport she had a young warbler in her hand sometime that was picked up from the lawn, and this seemed to delight her greatly. So did also her first appearance at playing in the sand. New experiences of this sort make her quiet, as if she were thinking them out and trying to understand them. The desire for sugar she expresses by vigorous, long-drawn sucking-movements and sounds, although she sometimes (but rarely) uses the word sugar.

Just now her imitation of spoken phrases, sentences and words is very active.

End of 95th Week.

686th DAY. L. made her first long compound sentence this week: "Unk—— gave me this 'poon and Grandma the one down tairs with kittie on it." She learns the names of objects by hearing them casually alluded to once. She does not use the plural form of words yet, so far as observed. She now understands that certain written marks represent her name, and said that she was "going to mark Lucia dere."

Certain sorts of mushy foods seem instinctively to disgust her at sight, e.g., soft egg, apple-sauce, stewed prunes, etc. No sign of any fears has made its appearance so far.

No sibilants or liquids have been voluntarily used as yet. She cannot wink her eyes singly, but can both at once readily and rapidly. She fully personifies her dolls as babies and said today "My

baby." She imitates speech much more readily than other actions. The reaction-time for automatic imitation of a phrase is from one to two seconds.

End of 98th Week.

691st DAY. Tonight for the first time in several months after going to bed L. spoke of the deepening darkness as if she dreaded it: "Don't want darkness!" Plurality of all grades she still expresses by "one, two, free, for, five" and says this often for quality. She enjoys saying opposites alternately in quick succession,—"get up, get down, get up," etc., "white bread, brown bread, white bread," etc. This is a curious sort of fickleness which gives evident pleasure to herself.

It is possible that this habit, common enough in children after a certain age and for years to come, may be deemed practice in the rudiments of reasoning,—the fixing and clarification of opposite meanings. It is certain, of course, that it provides practice in the motor processes.

Sleep is still " 'eep," and when urged to pronounce the sl sound her tongue gets twisted up in a curious way and so gives rise to many strange vocals, but, however much she tries, not to the desired sibilant sound. Its reflex appearance in her speech is a common occurrence.

End of 99th Week.

700th DAY. L. has a (passing) habit of sometimes walking about on her toes. She uses her right hand now for "marking"; to use the left hand for this purpose is apparently an uncomfortable effort. She tried to rub the tan from her wrist.

She often talks about "her baby boy" and yesterday said she would buy one with a penny up town,—

her own analogy from buying peppermints with a penny.

Certain of the colors, e.g., pink, now seem fixed while others are not. She was obviously more afraid of the dark last night than she was nine days ago.

End of 100th Week.

707th DAY. The saturated colors, black, white, yellow, orange, red, blue and green, seem now certainly fixed in her memory, for she always answers rightly; pink also she knows well and violet and brown.

End of 101st Week.

712th DAY. Emotional imitation is now noteworthy. L. cried violently merely because her companion (of like age) did so. Never as yet has she made answer to the question Why? concerning anything or stated in any form, although frequently asked of her. She clearly, then, does not as yet understand cause and effect, especially as they concern her motives for any action. Material causation is somewhat better realized, however. As already has been noted, her instinctive interest in and even love for young infants is now very strong—she pays no attention to a playmate of two-and-one-quarter years, but is interested solely almost in the latter's sister of six months. Evidence of dreaming is not now lacking. (See Day 214.) Very early this morning when L. had just waked up she said to her mother "ittle wite rabbit at 'ome!" and then in reply to my inquiry as to her dreaming of her white rabbit at home she said she had done so. Contrariety and whimsicalness are well marked of late.

She could not succeed in whispering when asked

to do so, although she lowered her voice considerably.

End of 102nd Week.

715th DAY. I tested L's stereognostic faculty for the first time today thus: Blindfolded her and asked her to tell me what certain objects placed singly in her hand were,—pocketknife, spool, silver matchbox, whistle, etc. She recognized them all almost immedately. The instinctive desire to use her eyes for this was obviously strong.

Compare with this efficiency of the normal mechanism with its coördination from the beginning of kinesthesia and vision, the hesitation of the forty-year-old "Farmer John" (J. H. P.), recently operated on for congenital double cataract. Shown a round ball and a square box, he said at first that he didn't know what to call them, but at the *third* effort he named them rightly. "He took a good look, closed his eyes, and, after a few moments, said he thought it (the box) was square and the other object round. He had to fit these strange contour-sensations of sight to familiar forms of touch [kinesthesia]. He had to imagine his fingers moving over these objects—all on curves with the ball, and on flat surfaces, straight lines, angles, and points on the box." (E. A. Ayres.)

The perfect interfusion of the various kinds of sensations of the normal individual, *all varieties* merging into the actual sensation-fabric, is a fertile fact often too much ignored in psychology. It is time that analysis began to give place to integration.

Without much effort or care, she draws "moons" readily now with a rapid circular movement, repeated. She says, "Eet" now—the best she can do for Yes. When her mother stopped while telling her a story, she asked her what she was thinking about, thus indicating her acquaintance with the experience of conscious thought and an accordance

of it to others. Using the colors in Bradley's sample-book, L. readily and invariably discriminates violet from red and from blue, and blue from green. This has not been until now tested recently, but today at least this degree of color-discrimination is very certain and complete. On the whole it seems likely that much of her observed "confusion" of colors has come merely from a real and very natural confusion of their arbitrary names. A sign like this v she at once said was a "bird" without ever having been told so far as known. She shows no fear of darkness now. No sensitivity to ridicule has been noticed lately, perhaps, however, in part because opportunity has been largely lacking. She is never seen nowadays to try to pick up a merely pictured object. Her present rendition of her personal name is much like "Ooty," with the accent on the first syllable. The reason for her changing of it from "Oose" (Day 497) is wholly internal and her own, so far as is known. Sibilants and liquids are still seldom heard in her speech. She no longer habitually uses any onomatopeic words for animals—never says "bow wow" for dog, etc.,—see 553rd Day.

L. put her shod toe in her mouth while dressed, voluntarily, when sitting in my lap. She goes upstairs fairly fast, sometimes alternating the knee she puts up and sometimes not.

720th DAY. In addressing me L. called me first "Laura," then "Mama"—absent-mindedly, as adults often do. Asked to point out the (saturated) color she likes best, her choice seemed to waver between red and yellow. She is rather young to make a judgment of this sort, but the above choice

seems valid from the way she acted when she had fully comprehended what was wished of her, an orange-red being probably her preference at present. It has changed from yellow probably with the development of the color-sense, yellow being the place in the spectrum of greatest intensity. She now uses pronouns "me," "my" and "I" only very rarely—usually she employs the third person, using her name. There is probably yet no clear idea of the meaning of numbers above two, but one and two she uses rightly. The "orderliness" noted on Day 339 is not apparent now; it was doubtless one of many passing fads or habits.

721st DAY. L. said this morning, "Look at the watch and see if it is time to get up!" Time-sense of a sort, therefore, has now developed; she does not, however, use the terms tomorrow, yesterday, today, yet, etc., but undoubtedly she understands a concrete tomorrow as that activity, etc., that she expects to experience after-she-goes-to-bed-and-gets-up-again, if one may so judge from her remark on Day 596. When asked the meaning of "tomorrow," she does not answer at all.

Silence in a child of this age under these circumstances implies an engrossing inner experience that inhibits the almost reflex reaction occasioned by a question. In this case this inner experience was perhaps deliberate thought as to the meaning of tomorrow. A bright little girl nearly five years old asked me this same week the meanings of tomorrow and of yesterday.

L. dreams often of her toys when asleep, as is shown by her talk at the time and when she wakes up.

End of 103rd Week.

724th DAY. She said this morning, "Did not go down on the beach yesterday"—this being her great daily delight—the first occasion on which time-words of this class have been heard. She understood the "84 cm" (which I told her was her height) as a number (and as a measure of space?) for she immediately began to count and to measure the wall.

Of her own will she twisted the stemwind of my watch; this is the first time that rotatory finger movements have been seen; the last time that she tried this action she could not do it: see Day 574. The reaction-time for understanding a remark has noticeably decreased in the last few weeks. The pronunciation of sibilants and of liquids has obviously followed the same course that many other acts have taken, namely, at first reflex and mechanically imitative, and so fairly perfect, then becoming voluntary and on this basis acquired gradually and only with difficulty. For example, sibilants at present are largely absent from her speech, but a few months ago they were not infrequent,—see Days 501, 504, 543, etc.

End of 104th Week.

741st DAY. For the first time today L. was heard to use the plural form of a noun: she said "boyth" for boys and "girzs" for girls.

742nd DAY. The first prominent signs of personal modesty are apparent now, for today she asked persons not to look at her.

End of 106th Week.

763rd DAY. Accustomed only to short rides down to the beach and out into Lovers' Lane, this week she called the three-mile road up to P—— the "big mama-road," and she similarly used the expression

"baby-sugar" for a little sugar. Mama and baby as concepts are thus shown to be thoroughly symbolic in her mind for large and small respectively.

End of 109th Week.

770th DAY. Spontaneously today L. used the expression "next week," but in a way to indicate that she has only begun to understand what such time-expresions mean. Her understanding of the concept is in process of formation now. She uses the pronoun "I" often now for herself, never using the expression "Lucia does so and so" as she formerly did once in a while; she now uses "my" rightly also. She is not beyond three yet in the comprehension of numbers save for the concept many, indefinitely, which she understands and expresses as "one, two, three, for, five, six." Speech develops rapidly and the use of idioms is beginning, some of them being rather complicated. She still gets "breakfast," "lunch" and "dinner" sadly mixed, "dinner" and "supper" being her usual terms. She cannot as yet pronounce the letter f even approximately.

End of 110th Week.

784th DAY. I couldn't induce L. this week to pronounce the sibilant S as for example in see—she still apparently can't (won't?) say the sibilant, but calls it "ee."

This week Monday she used the term tomorrow in its right sense, and seemingly with understanding, but she used the expression "next week" as if it referred to future-time indefinite in location, as she also used "next summer" (although she seems to associate summer thoroughly with Nova-Scotian experiences.)

Today she recognized the corner down which she has to turn to come home from the Public Gardens, directing that her carriage be turned that way. Common colors are now well fixed in her mind. She tore paper and threw it on the floor under my desk saying she did it "so she could hear Papa scold!" Accidentally making an unfamiliar rhyme, she was struck by its pleasantness and repeated the lines over and over. She recites "Mother Goose" with evident relish. She placed in a row Bradley's sample-colors, 4 x 1 inches, red, red-orange, yellow-orange, yellow, yellow-green, blue-green, blue and violet and she said the red-orange (pink) was the prettiest one to her, later vacillating between it and red; (yellow was formerly her choice, but probably because the brightest) (see DAY 720).

End of 112th Week.

820th DAY. L. shrugged her shoulders, but not expressively, this week; this action has never been seen more than once or twice before.

Comparison is very prominent in her mind now, the comparing of faces especially; she said, for example, that her Grandmama looked like "Dolly Ann", her Mother like M. B., etc. She noticed and remembered the ruffle on the neck of a dress of one of her little dolls, and was reminded of it by a similar ruffle in a picture. She put her doll to bed with all detail and then wished to have the gas lighted (it was almost dark) so that she could tell her daughter it was morning. Today she said "in this drawer?" the first time she has asked a discriminating question in this way. She patronized a playmate a little older than herself. L. still seems not familiar enough with "three" to use it spontane-

ously, but "two" she uses often. The expression of meanings by means of inflections have been observed for the first time this week, excepting perhaps her meaning in the feeling of impatience, now several months old. Inflections are, however, now already various, that of inquiry being commonest. Lately she habitually and instantly answers "Don' know!" to many questions whose answers she knows well, but she often rightly answers afterwards. She was delighted at watching some children coasting and eagerly wished to join them. She has used spontaneously no time-adverbs of late;—see Day 724, etc. She was greatly excited at seeing a horse run away. She uses her right hand for the more difficult acts now. She is very fond of using her voice for nonsense-sounds, sportively, when real words are not forthcoming fast enough. She can't answer to "Why?" as yet—the concepts of cause and effect have not developed. A slight "burn" on the end of her finger received from a hot radiator seemed to pain her for ten minutes or so, for she cried occasionally that long about it. Inquisitiveness begins to be prominent, and is exhibited chiefly in regard to more or less familiar pictured objects. She "tried" to pick up some pictured cherries, saying that she wished some. This is the same circumstance that was noticed when she was only a few months old, but as now at least she certainly does not confuse plane with solid objects, it suggests that she did not do so then (Day 354) either. She often walks backwards now. No "natural tendency to destructiveness" has ever been noted as yet. Personal neatness-habits are now very prominent again (see Days 539 and 720): she notices soiled hands,

costume, etc., quickly, washes her hands a dozen times daily, etc.

End of 118th Week.

829th DAY. No Why? has been heard from her yet. The notion of time seems now to be groping in her mind. She used "yours" in apposition to mine rightly today for the first time.

833rd DAY. One day this last week I held up three fingers and asked L. how many? and she promptly said "Tee!" so that she now understands threeness. She as yet, however, does not understand fourness. She "hides" in play by shutting her eyes tightly and covering her face with her hands like an ostrich. Personal modesty is now conspicuous.

End of 119th Week.

846th DAY. L. used the expression "reason for" so and so, indicating probably the dawn of the concept of causality clearly in her mind.

847th DAY. She didn't know how to count up to five and said that four cakes of soap were three in number. She readily recites the names of the numerals up to thirteen..

End of 121st Week.

954th DAY. Lately on a purely instinctive basis L. has been afraid of the steam-cars, but she readily conquered it voluntarily and even pretended to enjoy seeing them pass close by.

End of 137th Week.

976th DAY. Imagination is now very active; she played with my typewriting machine, using the carriage as a train of cars, making it go, ringing the bell, made her dolls ride, etc.,—all her own adapta-

tion. Many other marked illustrations of imitative and constructive imagination are not lacking daily. The last few days a desire to be learning by rote ("Mother Goose") has been conspicuous, and she goes about reciting snatches of various songs to herself or aloud. She does not yet ask why things are so and so, but often does ask "What do you do that for?—the same general concept. Imitative domestic play is now very complete in its details.

End of 140th Week.

1020th DAY. She had a toad to play with today and showed only slight signs of any instinctive reluctance to handle it, and what little there was was easily overcome by example.

End of 146th Week.

1058th DAY. Hearing a rag-man sound his voice today, L. said "That reminds me of the rag-man I used to hear when I sat on (her nurse's) lap in ——— Park." She left there when she was less than nine months old and she is now two weeks more than two and one-half years of age. Why? is now a relatively frequent question. She asked me where the water (from the faucet) all came from. She recites many rhyming little poems of three or four stanzas each. She is rarely herself now, but is in turn very many personages from "Santa Claus" to Mary——, a maid at Partridge Island last summer. These impersonations she often carries out long at a time consistently. She calls herself by her real name only when someone calls her by some other name—by the naturally egotistic principle of opposition. A few days since she was singing and did rightly part of an air—a few bars

of it—the first indication of a power of expressing a tune. She takes obvious delight in grotesque combinations of speech, e.g., "bowwow horse" instead of bow-wow dog, her imagination now being vivid. For fun she called an elephant "umpty."

L. imitates the tones of the voice very well. She still says "ee" for See! but can say the word rightly if she thinks and deliberately hisses before speaking it.

This list of 512 words was made from L's spontaneous diction at intervals during the last fortnight, being jotted down by her Mother as observed. Other words, first used sometime ago, are not in the list.

For, one, shoofly, bag, from, are, take, bother, dance, play, home, you, please, guess, pump, writing, yes, no, run, a, letter, I, want, cookie, don't, see, him, now, too, where, is, he, get, hammock, in, Mother, put, me, wish, had, pick, Mister, Spindler, sleep, nice, salt, there, little, squirrel, up, that, tree, you, didn't, so, many, it, looks, like, Lovers, Lane, took, watering, pot, and, watered, the, flowers, four, too, hard, break, in-two, couldn't, bit, hold, on, drive, all, flies, way, wet, warm, dry, cold, for, George ask, again, open, door, come, down, wash, my hands, kittie, off, bare, foot, bath, beach, sand, meat, potato, beans, pease, oatmeal, eggs, fish, cream, custard, house, pie, cracker, round, cake, nuts, orange, apple, water, coffee, tea, milk, bread, butter, sugar, pudding, jam, book, scrap, roses, violets, pansy, with, go, stay, will, fall, stairs, write, pencil, pen, seal, stamp, candle, match, paper, box, jewel, hair, ribbon, sash, comb, brush, mirror, pin, safety, shoe, slipper, moccasin, stockings, dress, petticoat, flannel, shirt,

band, elastics, mittens, coat, sack, sweater, bonnet, sun, hat, for, crying, trunk, train, satchel, steam, boat, seat, room, piano, organ, tambourine, girl, boy, baby, rain, snow, wind, blow, melt, made, rub, cheek, pitcher, pail, basket, grass, daisie, clover leaf, crib, right, let, grasshopper, shell, stone, bite, finger, nail, bird, rooster, toe, knee, ankle, hurt, stork, turtle, frog, button, hook, shoe, horn, carried, blossom, bench, lake, man, woman, jumped, ice, wagon, boat, cart, carriage, automobile, alligator, cloud, hospital, fire, hen, duck, chicken, goose, cried, lion, elephant, moose, mice, rat, cat, cry, laugh, nurse, bottle, dog, trout, fish, horse, cow, chocolates, peppermints, sunset, dirty, sticky, tonight, tomorrow, yesterday, afternoon, morning, evening, noise, peek, scream, dark, story, empty, here, feeding, got, floor, wall, bag, pocket, book, cup, board, table, chair, stool, rocking, rock, eat, talk, sliver, tail, scratch, growl, ship, swim, float, neat, clean, fresh, sweet, sour, pepper, string, powder, beer, wax, gum, sorry, glad, Oh, cook, because, bit, tried, couldn't, but, pleasant, chair, watch, drank, mistress, master, funny, home, mean, kisses, taste, caterpiller, butterfly, maple, climb, splashing, drink, pretty, very, katydid, berries, bee, fly, nipples, star, sun, silly, joking, cough, sneeze, blazing, getting, something, wonder, suppose, right, moon, ball, racket, tease, turkey, belt, knock, vessel, sails, dipping, grey, terrible, comfortable, fishing, fell, damp, black, white, green, yellow, blue, red, pink, brown, tennis, hot, medicine, doctor, camera, picture, photographs, taken, desk, slate, draw, curtain, bureau, lamp, needle, thread, ring, bracelet, chain, beads, pillow, cushion, sheet, blanket, spread, washcloth, towel, soap, bathe, bathtub, cup, spoon, fork, knife,

napkin, bib, toothbrush, teeth, envelope, mouth, eyes, nose, forehead, ears, neck, elbow, fingers, back, bottom, legs, thumb, shawl, paint, bake, clothes, spring, money, river, lake, well, sick, hope, love, delighted, surprised, fell, shed, key, piazza, rug, electric, car, bridge, station, mug, glass, sidewalk, road, street, fence, hall, carpet, closet, chimney, children, penny, barn, round, pier, island, doesn't, her, dining, room, we, going, breakfast, supper, dinner, lunch, that, doll, dishes, bicycle, biscuit, strawberries, whistle, not, going, cheese, thermometer, fast, naughty, sleepy, hungry, tired, lonesome, plum-tree, brother, sister, grandmother, whistle, bell, frightened, etc.

End of 152nd Week.

1095th DAY. This is L's third birthday-anniversary. She still says "ee" for See and "ouf" for self, these being the most marked defects in her speech. She often nowadays asks Why? and already is "learning to wonder."

End of 157th Week.

INDUCTIONS.

[The following considerations seem to be suggested by the herein-noted observations of *this child.* This is no implication that other observations have not and may not show their inadequacy or even refute them. These inductions are offered for no more than they are worth; their order here is of no significance.]

I. Inhibition is a fundamental function obviously fully developed at birth. It is then purely a reflex process set in action most readily by touch and hearing, but is influenced also by vision.

The general presence of inhibition in the infant greatly complicates the interpretation of child-behavior, for we can seldom know how large a part the restraining influence takes in the algebraic balance of reactions.

The development of voluntary inhibition somewhat precedes the evolution of voluntary movement.

II. The left side of the body seems both more reflex and somewhat more precocious than the right side. In other words, it seems to be more distinctly the mechanical implement of the organism's will, while the last is still largely reflex.

III. The inherited outfit of the child may not unreasonably be deemed to involve processes that are usually classed as distinctively "mental,"—for example perhaps a reflex sort of simple recognition. In other words, the separation of a human being's

activities into psychologic and physiologic is often more or less arbitrary and frequently an impediment to the real progress of knowledge.

IV. The essential kinesthesia, of low intensity but of extensity as wide as the organism and always being experienced, constitutes the basis of pleasantness that leads to the gradual conscious arrangement of the motor ideas at the basis of voluntary control. The movement-sensations leave lively memory-images whether the movements be accidental, passive, or reflex. Education should make them more fully conscious and develop them, so increasing the proper motor precocity and later the efficiency of the individual.

V. The subconsciousness of children is a neglected field of genetic psychology. There must be continually a host of subliminal impressions, actuating and inhibitory, ceaselessly impinging on the extremely sensitive and plastic neuromechanism of the infant. This "impulse to activity" with its generally pleasant tone is subconscious, and so is later on, more and more, the totality of sensory and motor experiences fused into the psychomotor memory of the mechanism of efficiency.

VI. Deliberate, voluntary effort consists in greater or less part in an introspective clarification of the motor "ideas" involved—arrangement, perhaps, of the kinesthetic sensations. Consciousness, save our own to ourselves, is inherently objective, so that there are seldom plain evidences of this clarification. The clonic movements often seen during the earlier stages of the development of voluntary movement probably are means of impressing and of clarifying these kinesthetic influences. The rhythmic nature

of smooth-muscle's action may thus continually impress the sympathetic in the case of the vegetative movements.

VII. The reproductive imagination is inherently motor in the absence of voluntary inhibition.

VIII. The inherently inhibitory nature of attention is in evidence (even from the first day of "life") from tactile and auditory stimulations.

IX. Imitation is the method-basis of the greater part of advancement in voluntary development—imitation of one's self and of others. It consists essentially of habit, more or less varied by will or by chance, plus direct reflex or voluntary imitation.

X. It may be that the reason that eye-following movements are reported often so late is that the usual incoördination of the eyes prevents the clear vision necessary for the clear perception required for reflex following.

X. The evidence goes to support the genetic theory of the conception of space, time, and causality.

X. Because, perhaps, of the development of a feeling of smiling incongruity, it is common in child-study to mistake play for an unplayful action, and the former frequently contains misleading elements of caprice.

XII. There is an innate tendency in the unfolding mind to the use of symbols, especially those involved in self-expression.

XIII. The effective recognition of emotional "expressions" in others is more or less innate, as appears at a very early age. This understanding is in itself directly motor.

CHRONOLOGIC EPITOME OF THE OBSERVED DEVELOPMENT.

1st WEEK. Blinking, reflex, from stroking of nose. Coördination of eyes. Finger-grasp, reflex. Inhibition, reflex, from touch-sensations. Perceptions, reflex, of touch. Pursing, reflex, of mouth from touch on either lip. Shaking, reflex, of head. Sneezing. Suction, reflex, on fingers. Yawning. Hiccough. Reaction, sthenic, to light. Smile, reflex. Closing, reflex, of eyes to light. Inhibition, general reflex, from sound. Reaction to sound. Sounds perceived. Turning, reflex, of head from light. Emotional facial reactions. Smile, spontaneous. Unpleasantness. Stretching, reflex, of body.

2nd WEEK. Drawing-back, reflex, of head. Scratching, reflex, of own face. Vomiting, reflex. Extrusion, reflex, of nipple at satiety. Pleasantness-reaction at a person's face. Raising, reflex, of arms, from noise. Touch-reflex, fading of. Fright-gasp. Groping, reflex, for breast. Eyes follow, reflexly, light. Frown. Internal strabismus. Perception. Sneezing, from light. Spreading, reflex, of toes, from touch. Unpleasantness of removal of fist from mouth. Eyes follow, reflexly, hand. Fixation of vision.

3rd WEEK. Replacing, reflex, of finger in mouth. Reaction to discomfort. Memory-image. Laugh. Sitting-attempts, reflex.

4th WEEK. Reaching with arms, reflex. Recognition,? reflex, of bottle.

7th WEEK. Pupillary reaction to light. Tears. Flexion, lateral and vibratory, of head, hanging free. Pleasantness of passive movement of limbs. Shaking of head, hanging free.

8th WEEK. Abduction, reflex, of big toes from tickling of sole. Extension, reflex, of toes from tickling of sole. Flexion, reflex, of leg from tickling of sole. Holds head erect. Rhythmic reflex movements of four limbs from massage of abdomen. Squaring, emotional, of lower lip. Eyes follow, voluntarily. Heat, pleased enjoyment of. Seizing, impulsive, of left ear. (Habit fading.) Vocalization of ă. Opening eyes as sign of pleasure.

9th WEEK. Breaking, passive, of habit-complex. Taste. Anger in cry. Imitation, reflex, of gurgling. Recognition of Mother. Smell, recognition of Mother through?

10th WEEK. Perception, conscious, of image in mirror. Grasping, reflex. Fear of passing people. Pain, crying from.

11th WEEK. Conception of tridimensional space (on 17th Week). Reaching with arms, voluntary. Habit of posture. Rubbing knuckles in her eyes.

12th WEEK. Vocalization of ā, oo. Interest in own hand. Direction of sounds, perception of.

13th WEEK. Fear of crackling of paper. Imitation, reflex, of shaking left hand.

14th WEEK. Recognition of the unfamiliarity of a stranger.

15th WEEK. Fear of piano-music.

16th WEEK. Sitting up, reflex, by drawing on arms.

17th WEEK. Closing, voluntary, of lips against cold food (ice cream). Perception of coldness of food by lips. Recognition of own name. Accommodation, before this time. Picking-up, reflex, from touch-stimulus. Sthenia, general, of redness.

18th WEEK. Opening of hand, voluntary. Seizing, voluntary, of toes. Wink, reflex, from threatening movement.

19th WEEK. Imagination. Inhibition, voluntary, of wink-reflex. Rhythm, in babbling.

20th WEEK. Biting of fingers. Fear of water. Expectancy. Pulling, voluntary, of hair. Perception of similarity.

21st WEEK. "Brown study." Interest, voluntary. Comparison, deliberate, of an object and its mirror-reflection. Conception of similarity. Wonderment. Attempt to stand.

22nd WEEK. Association of noise of hand-clapping and the movement. Repetition of actions. Conscious revery. Memory of antics. Rotation, voluntary, of hand. Smell.

23rd WEEK. Extension, voluntary, of trunk. Missing of water in bath-tub. Chewing, reflex, from hunger. Association of her name with herself. Sitting-up, unassisted.

24th WEEK. Delight at seeing Mother again. Reaction-time of voluntary grasp greater than that of reflex-grasp.

25th WEEK. Imitation, voluntary, with mouth. Shrugging of shoulders.

26th WEEK. Discrimination of objects. Fear of dark. Fear of harsh noise. Support of her weight on feet. Walking, reflex. Fear of falling.

27th WEEK. Creeping-attempt. Discrimination of red from green. Perception of a hair.

28th WEEK. Imitation, voluntary, of hand-waving. Attention, voluntary. Self-possession. Unpleasantness of the touching of fur, etc.

29th WEEK. Desire-grunt. Tearing, voluntary, of paper.

30th WEEK. Vocalization, voluntary, variety in. Moral sense.

31st WEEK. Inhibition, voluntary, to turn around. Discrimination of inflections. Dreaming. Grimaces. (Habit gone next week.) Sensibility to ridicule.

32nd WEEK. Fear of bunch of keys. Shaking, voluntary, of a rattle.

33rd WEEK. Discrimination of colors red, yellow, and blue. Traction, voluntary, on string. Imitation, voluntary, of complex movements.

34th WEEK. Swallowing, voluntary. Surprise. Conscious thought.

35th WEEK. Marking, voluntary, with pencil. Association of an object and its name.

36th WEEK. Traction, voluntary, on her own dress-skirts to see feet. Vocalization of consonant.

37th WEEK. Closing, clonic and voluntary, of right hand as sign of desire for an object.

38th WEEK. "Destructiveness." Fear of shod foot.

39th WEEK. Waving, voluntary, of hand for good-bye. Pity, from tone of voice.

41st WEEK. Use, spontaneous, of word papa.

43rd WEEK. Imitation, voluntary, of gutteral vocal. Dancing, reflex.

44th WEEK. Swinging of legs, voluntary. Waving, voluntary, of feet. Blowing, voluntary, through nose.

45th WEEK. Dancing, voluntary. Extension, voluntary, of tongue. Delight in association with another child.

46th WEEK. Vocalization, voluntary.

47th WEEK. Calling, voluntary, of a person.

49th WEEK. Play, imitative.

52nd WEEK. Ambidexterity. Blowing, voluntary. Smell, disagreeable.

53rd WEEK. Jealousy. Understanding of pronouns.

54th WEEK. Shaking, voluntary, of head with hands.

55th WEEK. Creeping. Taste, disagreeable.

58th WEEK. Delight in looking at pictures. Fear of the uncanny. Feeling of uncanniness. Conception of utility (of a pillow).

59th WEEK. Bashfulness. Pouting. Suggestibility.

60th WEEK. Anthropomorphism. Noise-making, deliberate.

61st WEEK. Standing, voluntary. Shaking, voluntary, of head.

62nd WEEK. Musical sense. Expression, voluntary, by facial expressions. Nodding in affirmation. Pretence.

65th WEEK. Rolling, voluntary, of ball. Vanity. Vocalization of inflection.

66th WEEK. Vocalization of liquid sounds.

67th WEEK. Walking, voluntary. Laughter at picture of crying child.

68th WEEK. Circular movements in drawing. Personal opposition.

70th WEEK. Use of "Doo!" in desire.

71st WEEK. Talking in sleep. Eagerness for language. Effort unpleasant to imitate words.

73rd WEEK. Imagination, reproductive, of tune. Use, spontaneous, of "good night."

74th WEEK. Conception of the meaningfulness of printed letters. Repetition of words.

75th WEEK. Getting up, voluntary, to stand.

77th WEEK. Conception of causality. Self-consciousness. Orderliness-habit.

78th WEEK. Discrimination of brightness (yellowishness).

79th WEEK. Discrimination of colors other than red, yellow, and blue. Walking backwards.

81st WEEK. Catching of object let fall.

82nd WEEK. Closing, voluntary, of eyes.

83rd WEEK. Vocalization of sentence.

84th WEEK. Wiggling, voluntary, of toes. Feeling and understanding of humor.

85th WEEK. Control, voluntary, of sphincters.

86th WEEK. Conception of time. Use, spontaneous, of word tomorrow.

91st WEEK. Perception, disagreeable, of wetness on fingers. Use of prepositions.

98th WEEK. Disgust at mushy foods, etc.

102nd WEEK. Dreaming, recollection of.

103rd WEEK. Going upstairs. Perception, stereognostic. Absent-mindedness. Preference for redness.

104th WEEK. Rotation-movement with fingers. Understanding of the measurement of space. Use, spontaneous, of word yesterday.

106th WEEK. Modesty, personal. Use of plural forms of words.

110th WEEK. Conception of threeness. Use, spontaneous, of I.

112th WEEK. Conception of tomorrowness.

118th WEEK. Comparison, deliberate, of faces, etc.

121st WEEK. Counting to thirteen.

140th WEEK. Recognition of a melody.

152nd WEEK. Pretence of being someone else. Singing of a part of a tune rightly. Use of nonsense-words.

ALPHABETICAL ARRANGEMENT
OF
VARIOUS FIRST-APPEARANCES.

	Day.
Abduction, reflex of big toe, from tickling of sole	50
Ambidexterity	358
Absent-mindedness	721
Accommodation, before day	119
Anger in cry	59
Anthropomorphism	420
Association of an object and its name	240
Association of her name with herself	161
Association of noise of handclapping and the movement	148
Attempt to stand	147
Attention, voluntary	196
Bashfulness	407
Biting of fingers	134
Blinking, reflex, from stroking of nose	1
Blowing, voluntary	358
Blowing, voluntary, through nose	308
Breaking, passive, of habit-complex	57
"Brown study"	144
Calling, voluntary, of a person	327
Catching of object let fall	567
Chewing, reflex, from hunger	159
Circular movements, in drawing	476
Closing, reflex, of eyes to light	6
Closing, clonic and voluntary, of right hand as sign of desire for an object	256
Closing, voluntary, of both eyes	574
Closing, voluntary, of lips against cold food (ice cream)	113
Comparison, deliberate, of an object and its mirror-reflection	146

Day.
Comparison, deliberate, of faces, etc..... 820
Conception of causality 536
Conception of the meaningfulness of printed letters 513
Conception of similarity..... 146
Conception of threeness..... 770
Conception of time..... 596
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